Basu
&
Das

THEORY
AND
PRACTICE

OF

COSTING

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(VOLUME I)

By

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With authors' heart-felt regard and compliments
as are due only to him.

CONTENT

EVOLUTION OF COST ACCOUNTING

Eevery modern business has to make its way through keen competition, uncertainty and risks. Quick changes in social and economic environment also create impact upon the businesses. Changes in political outlook of the government of the country also require adjustment in the business policies. Thus, a modern business becomes more and more complex in nature.

In old times the business concerns were small in size ; there was no keen competition ; necessity of adjustment in business outlook due to changes in social, economic and political outlook was rare and the owner/owners of the business could maintain personal contact with the business and gather all information relating to the business whenever necessary. The present-day business is big in size and complex in character and is under keen competition. So information relating to the business in detail, appropriate management policy on the basis of detailed information and proper execution of such policies can only bring about success.

As the successful treatment of a sick person often requires various pathological information, the successful management of a modern business requires various information regarding the business. The traditional Financial Accounting fails to furnish all information necessary for managing a modern business successfully. Thus, as a branch of Financial Accounting, *Cost Accounting* has evolved and made rapid progress during the last few decades. This branch of accounting, with its developing techniques and procedures, has been rapidly expanding in the fields of its application. In recent years, another aspect of accounting, called *Management Accounting*, has been developed and is being employed in many concerns.

Where *Financial Accounting* limits its activities in determining the financial result of trading during a given period of time and stating the financial position as on the closing date of the period, *Cost Accounting* takes the responsibility of generating information for controlling operations with a view to maximising efficiency and hence profit, and *Management Accounting* takes the duty of assisting the management with information for planning and decision making.

The belief that Cost Accounting developed after the rise of factory system as a result of Industrial Revolution in England, is not true. Some Cost Accounting principles were found in application as early as 14th century. Some authorities suggest that, the present-day Cost Accounting procedure was established at the end of the 19th century. However, major developments in the subject were noticed during a quarter century before the end of the

second world war. The scientific management movement led to the development of Standard Costing. After 1945, the need for data in planning for the future was felt and Cost Accounting developed further. The technique of *Cost Control* is a recent development. *Cost Audit* also emerged as a branch and it is developing further.

Thus, the evolution of Cost Accounting has been a natural process through the growing necessity of information about the organisation which the traditional Financial Accounting system fails to supply. *The main causes behind the development of Cost Accounting system* may be enumerated as below :

(a) Financial Accounting can give the net result of trading during a particular period. It can not give (normally) the product-wise picture nor it can say that the result obtained is, what it should be.

(b) Financial Accounting does not find out the cost of the goods manufactured and hence it fails to help the most important business activities like price-fixing, price-cutting during depression, formulating marketing policies etc.

(c) Financial Accounting never aims at making an effort for converting a losing unit into a profitable one through cost control.

(d) Financial Accounting does not provide means for controlling different elements of cost, reduction of expenses, elimination of wastage, measurement of levels of efficiency etc.

(e) Financial Accounting presents the total cost as incurred during a period, and that also, at the end of the period. It cannot present the costs incurred daily and in the absence of this day-to-day information control becomes impossible.

(f) Financial Accounting cannot properly guide the management in respect of making decision on various matters, such as, closing down a unit apparently making loss, introducing a new product or product-mix, going for dumping in foreign market etc.

(g) Financial Accounting fails to locate the disease in an organisation due to which it runs at a loss, that is, it fails to point out the exact spot of inefficiency which may remain in any of the factors—material, labour, plant and equipment or management.

(h) Financial Accounting also fails to explain properly the result with appropriate brake-up.

Note : The above points (*a–h*) are also the limitations of Financial Accounting. Due to these limitations, Cost Accounting has evolved.

COST ACCOUNTANCY

The Terminology published by the *Institute of Cost and Management Accountants, London,* defines Cost Accountancy as "the application of costing and Cost Accounting principles, methods and techniques to the science, art

and practice of cost control and the ascertainment of profitability. It includes the presentation of information derived therefrom for the purpose of managerial decision-making." Cost Accounting is also defined as the "process of accounting for cost from the point at which expenditure is incurred or committed to the establishment of its ultimate relationship with *cost centres* and *cost units*." Broadly, Cost Accounting covers the activities like preparation of statistical data, application of cost control methods and ascertainment of profitability of the work carried out or planned.

While presenting the above definition of Cost Accounting we came across the terms *cost centres* and *cost units*. Let us see what they mean.

A Cost Centre is a location, person or item of equipment (or group of persons or equipments) for which cost may be ascertained and used for the purpose of cost control. Thus, when a cost centre refers to a location or equipment (or group thereof) it is an *impersonal cost centre* and when it refers to a person (or group of persons) it is a *personal cost centre*.

In organisations having manufacturing activities, cost centres are determined according to the pattern of the layout of the factory. In this case, cost centres may be broadly classified into- (i) *Production cost centres* (i.e., those engaged in production work like machine shop, welding shop, grinding shop, polishing shop, painting shop, assembly shop etc. All direct and indirect costs are incurred in such cost centres), and (ii) *Service cost centres* (i.e., those engaged in rendering services to the production cost centres. Only indirect costs are incurred in these cost centres). The examples of services cost centres are –material service centres (such as stores, internal transport), Personnel Service Centres (such as labour office, labour bureau, canteen), plant maintenance centres (such as tool room, carpentry, smithy) etc.

In manufacturing organisations there may be two other types of cost centres. These are—(i) *Operation cost centres* consisting of machines and/or persons carrying out similar operations and (ii) *Process cost centres* consisting of those engaged on a specific process of manufacture. The cost of a particular operation or process, irrespective of location, equipment or person in the factory, can be known through these cost centres.

It may be noted that in case of personal cost centres the cost may be analysed and related to any level of management according to the pattern of the organisation. For example, cost may be analysed and related to works manager, sales manager etc. or at lower level to foreman, store-keeper etc.

The purposes of cost centres are as follows :

First, cost centres locate the responsibility. The manager of a cost centre is responsible for the control of costs of that centre. Costs are controlled with relation to cost centres and hence cost centres are often called 'Responsibility Centres.'

Secondly, cost centres facilitate recovery of overhead expenses. For example, a number of similar machines performing similar type of work may be constituted into an equipment type of cost centre. Expenses may be analysed and related with this cost centre so that hourly rate of recovery on the basis of machine hours can be ascertained.

A Cost Unit refers to the unit of quantity of product, service or time (or combination of these) in relation to which costs may be ascertained or expressed. *Cost centres* help ascertaining costs by location, person, equipment, operation or process : but *Cost units* help the subdivision of such costs as attributable to products or services.

The following are the usual cost units in various industries :

(a) *Tonne*—in industries like mining, iron & steel, cement, sugar etc.

(b) *Metre or kilometre*—in industries like cable, rope, road construction, wire etc.

(c) *Litre, kilogram, tonne*—in chemical industries.

(d) *Cubic Metre*—in gas industries, casting industries, lumber industries etc.

(e) *Thousand*—in brick fields.

(f) *Kilo-watt hour*—in power industry.

(g) *Tonne-kilometre or Passenger-kilometre*—in transport industries.

(h) *Bags* (of standard weight)—in nuts & bolts industries, in mint (manufacturing coins) etc.

(i) *Square metres*—in industries like nickel plating, fabric printing etc.

COST ACCOUNTING AND OTHER BRANCHES OF ACCOUNTING

Financial Accounting and Cost Accounting

In earlier days, cost records, as separate and distinct from financial accounts, were maintained. At the end of each accounting period the two sets of accounts, financial and cost, were reconciled. Later, it was found necessary to maintain integrated accounts (i.e., integrated cost and financial accounts) because, data required for cost accounting are mainly taken from financial accounts and hence maintenance of cost accounts, as completely separate from financial accounts, was no longer necessary.

Financial accounting consists of recording, classifying and analysing the business transactions so as to facilitate the preparation of Profit & Loss Account for a period and also the position Statement (i.e., Balance Sheet) as on a particular date. Thus, the emphasis of financial accounting is on the ascertainment of Profit or Loss of the concern and not on the more important aspects of the business i.e., planning, control and decision-making.

Cost Accounting analyses the transactions in an objective manner for the purposes of planning, control and decision-making.

From financial accounts we can know the cost of manufacture of products in totals and only at the end of the accounting period. The cost of manufacture, product-wise, and in course of manufacture, cannot be known from financial accounts for the purposes of control, planning and decision-making. For these purposes, product-wise cost must be known in course of manufacture. For achieving this, cost accounting becomes essential.

If there are three products of a concern, one or more may show loss and the other or others may show profit. The financial accounts will show the ultimate profit or loss from all products taken together, while the cost accounts will show the profit or loss on each product separately.

The aim of financial accounting is to safeguard the interest of the business, its proprietors, creditors and the government. The financial accounts are prepared in such a way as to comply with the requirements of Companies Act, Income-tax Act, Sales Tax Act, Excise etc. How profitably the financial and other resources of the business were utilised is shown by the financial accounts, but they do not indicate clearly what should be done with such resources in particular circumstances. This purpose is served by cost accounting. For example, financial accounts show the payment to workers recruited, payment for materials purchased, the value of materials at the beginning and at the end etc. ; while the cost accounts reveal matters like, reasonability of purchase of material or employment of labour, wastage of material in course of production, wastage of labour-hours, whether purchase is more advantageous than manufacture or not, whether quantity of material used in production is justified or not, etc.

Cost Accounting, through its forward-looking approach, controls the future costs, which the financial accounting cannot.

There is least flexibility in financial accounting as the accounts are prepared on the basis of historical records : while there is enough of flexibility in cost accounting, because concept of cost may undergo changes if so required by the management.

Under financial accounting, accounts are usually prepared annually, but under cost accounting, accounts may be compiled monthly, weekly and even daily, if so required, for the purpose of control and decision-making.

Economics and Cost Accounting

It is a common belief that, Economists are interested in the affairs of industries or nations and Accountants are interested only in the affairs of single firm (private or public). Economists make macro and micro economic analyses in detail. New techniques of economic analysis with special reference to business decision have been developed. Accountants are also concerned with opportunity cost, marginal cost, differential cost etc. which are some of the subject-matters of economics. Economists and Accountants both use mathematical tools of analysis like, operation research with different techniques to help any individual firm or government in making decision as to the best allocation of resources. It is a fact that, Economists and

Accountants work on different dimensions. Economists rely in many cases, on the data supplied by Accountants. Economists, now-a-days, are becoming more and more interested in topics of accounting. Accountants are also not satisfied with the traditional recording of historical data. They adjust data for budgetary control, profit planning etc. after taking into consideration the economic trends of various factors.

The concept of profit advocated by an Economist widely differs from that advocated by an Accountant.

So far as valuation of assets is concerned, Accountants value fixed assets at historical cost less depreciation. Inventories are valued at cost or market price whichever is less. They put value to intangible assets like goodwill. Accountants do not have any objection to the Economists' view that assets have value only when they contribute to the future income. Thus, at the end of any accounting period, assets may be revalued so that they can represent their true worths, if such revaluation is necessary for formulating business policies.

Statistics and Cost Accounting

The word 'statistics' either means "the facts shown in number" or means "the science that includes collection, presentation, analysis and interpretation of numerical data." Cost accounting is involved in compilation of data for management information. So, according to the former meaning, a cost accountant is a statistician and sometimes more than that, because he is to express different cost concepts in several ways according to the needs of the management, to assist cost control, to give financial advice, to fix selling price etc. When 'statistics' means the science of statistics, its scope is much wider than that of cost accounting.

Mathematics and Cost Accounting

A cost accountant has to employ fundamental mathematical techniques for analysis or synthesis, calculating ratios, absorption of costs, ascertainment of variances etc. This does not indicate that Cost Accounting and Mathematics are similar. 'Mathematics' means a vast area of knowledge and not only the fundamental arithmetic or algebra. It cannot be expected that, a Cost Accountant should gather all the knowledges of mathematics. With the advent of computer system more and more complicated mathematical processes can be used easily by the Cost Accountants.

'Mathematics' is more than 'Cost Accounting' in one sense and in another sense 'Cost Accounting' is not 'Mathematics', because 'Cost Accounting' is a procedure to follow, in divergent circumstances and according to the needs of the management etc. 'Mathematics' may be helpful in this respect, but cannot do all that is required.

Management Accounting and Cost Accounting

The accounting service through which management is assisted, at all levels, in respects of policy-making, planning, controlling the execution of plans and appraising of performances, is known as Management Accounting.

It is a recent development, but is gaining importance rapidly in various concerns. Management Accounting utilises the information of both financial accounting and cost accounting in the best interest of the business. It is primarily concerned with supply of information to the management so that the management can manage the business efficiently in order to maximise profit. Management Accounting employs many techniques like budgetary control, marginal analysis, uniform costing, standard costing, ratio accounting, project accounting, internal audit, fund-flow analysis, cash-flow analysis etc. Cost Accounting also supplies information to the management and it utilises most of the above techniques also. So the principal object of both Management Accounting and Cost Accounting is similar. Thus, Cost Accounting may be considered as a part of Management Accounting or Management Accounting may be considered as the managerial aspect of Cost Accounting.

COSTING

While Cost Accountancy is defined as "the application of costing and cost accounting principles, methods and techniques to the science, art and practice of cost control and the ascertainment of profitability" including the "presentation of information derived therefrom for the purpose of managerial decision-making" ; costing refers to the techniques and process of ascertaining cost. (Cost, again, is defined as the actual or notional expenditure incurred on, or attributable to, a given process, product or service.)

The technique of costing involves mainly—
(a) collecting expenditure ;
(b) recording and classifying the expenditure according to the elements of cost ;
(c) allocation and apportionment of the expenditure to the process, operation, product or service.
[The elements of cost will be discussed later]

NEED FOR COSTING

Why Costing is needed can best be answered by explaining the objects of Costing, the purposes it serves and the advantages derived from costing.

The *main object* of costing is to record and analyse the expenses with a view to *knowing the cost* of a unit of output, of a job, of a process or of an operation. It involves, therefore, allocation of expenditure.

The *next equally important object* is to exercise *control* over cost. Idle time of machine and labour are controlled, materials are controlled so that wastage in minimised and expenses are also controlled so that they can not unreasonably inflate cost. Standards are set and actuals are compared with the standards. The difference detected are brought to the notice of the management for proper action. For the purpose of control, costs of different periods are also compared. Costing exerts control over all elements of cost in detail, in order to minimise cost and maximise profit.

The *third object* of costing is to help *formulating policies*. Costing helps management by supplying necessary information so that the management can adopt a sound policy on any matter. For example, whether purchase of a component is cheaper than manufacturing the same, can be illustrated by cost information. Costing can prove that it may be profitable to continue an apparently losing product by marginal analysis. That dumping in distant market may be profitable, can also be illustrated by cost analysis.

The *fourth object* of costing is to help management in *fixing the selling price*. It is obvious that, unless costing ascertains the cost of sales, the selling price cannot be fixed. Selling price is fixed by adding the margin of profit to cost. Sometimes during depression, selling price may have to be fixed just to cover variable costs. In that case, the concern runs at a loss for the time being. In order to expand market, the selling price may be fixed a little over variable costs so that the selling price contributes a meagre sum towards the fixed costs. In this way the concern attempts to fight out the competitors and to increase the price afterwards so as to cover the past losses.

The *fifth object* of costing is to help management in its effort to *maximise output and profit*. By break-even analysis, costing can ascertain the appropriate output that gives a desired amount of profit. •To achieve that output, costing helps the management by providing necessary information regarding the weak points of the organisation, possibilities of improvement, desired product-mix, development of by-products etc.

The *sixth object* of costing is to help *Cost Negotiation*. The basic industries may have to face problems of price negotiation with the government authorities. Costing system lays the foundation for such negotiation.

The *seventh object* of costing is *Forecasting*. Long-term forecast requires the consideration of factors like sales, cash position, capital expenditure, market variation, profit expected etc. The overall guiding factor is the *return on capital*. Costing helps forecasting in appropriate manner.

The *eighth object* is the *planning of capital expenditure and capital structure*. Costing department supplies valuable statistics to help planning capital expenditure and capital structure. The statistics relate to operating cost, cost behaviour at different levels of activities, rapidity of turnover, working capital requirements and many other matters.

The *ninth object* of costing is *to help facing depression*. Cost accounting grows in importance during the period of depression. It is rightly said that, *depression in industry creates boom in employment of costing personnel*. In an attempt to face depression, steps like cost control, cost reduction, selecting new products or product-mix, searching for new sales areas, creating cost-consciousness, diverting to new lines of activities, discriminating price policy etc. are taken. Without assistance from a good

costing system the management shall not be able to decide as to which step or steps shall be appropriate at the moment.

The *tenth object* of costing is the *planning to close down*. Closing down a department is the last step. The condition deteriorates from sometime before. Costing department, after studying the trends of various conditions, alerts the management to take the decision, well in advance, so that much capital is not lost due to late closing down. However, workers' resistance, government interference etc. will cause some dely.

The *last, but not the least, object* of costing is to *help choosing between 'making' and 'buying'*. Where making is less costly than buying, one must make. Costing department can only say what is more economic. Similarly, selling through own organisation may be preferable to selling through wholesalers. Costing department can help deciding on this issue by supplying information relating to the strength and efficiency of the selling unit, middlemens' commission, price behaviour, turn,ver ratio, capital supply etc.

ADVANTAGES OF COST ACCOUNTING

Let us now examine the advantages that are derived from Cost Accounting.

The nature and extent of the advantages that may be expected from a costing system depend upon the type, adequacy and efficiency of costing system installed and also upon the preparedness of management, at all levels, to accept and act upon the advices given by the costing system. The following are the principal advantages of a well installed and well accepted costing system :

(a) **Elimination of wastes, losses, inefficiencies**

Idle time ; lost time ; idle facilities ; wastage of materials in the form of spoilage, excessive scraps etc. can be eliminated by employing a good Costing System.

(b) **Cost Reduction**

By operational research new and improved methods of production are invented by a good costing system so as to reduce cost.

(c) **Detection of reasons for Profit or Loss**

A costing system finds out the actual reasons for reduction in profit or increase in profit. It identifies the product that runs at a loss and suggests to the management the ways of its improvement or possibility of shutting it down.

(d) **Advices on various matters**

Cost Accountant, on the basis of cost information, can advise the management in such a way that the management can rightly choose the best out of many alternatives. Management, without appropriate advice

from the Cost Accountant, cannot decide whether to buy or make, whether to accept orders below cost or not.

(e) Fixation of Price

Cost accounting helps the management to fix price and to prepare estimates for submission of tenders etc.

(f) Cost Control

Cost accounting, by fixing standards and budgets and comparing the actuals with standards or budgeted figures and finally analysing the variances, points out to the management the weak and strong points so that the management can exercise control. Period-to-period cost comparison also helps control.

(g) Assisting the Government, Trade Unions etc.

The Government uses cost information for maximum price fixation, price control, tariff protection, minimum wage fixation etc. Trade Unions also use cost information for solving trade disputes etc.

(h) Marginal analysis of cost

It is done for facilitating the short-term decisions, particularly in times of trade depression.

(i) Fixation of Responsibility

For appropriate cost accounting, cost centres and responsibility centres are determined. When responsibilities are properly defined and fixed on individuals, it becomes difficult to evade responsibility of performance and as a result, overall efficiency improves.

(j) Helping preparation of Final Accounts under financial accounting system

Cost accounts readily supplies the figures for closing materials, work-in-progress and finished goods. So, final accounts can be prepared without any delay for ascertaining such values.

(k) Prevention of Frauds etc. and thereby helping the management, the Government and others connected with the organisation

By introducing cost audit, frauds can be prevented, correct and reliable data can be obtained, not only by the management but also by the Government, the shareholders, the creditors etc.

CRITICISMS AGAINST COST ACCOUNTING

The following points of criticism are sometimes levelled against the costing system :

(a) Heavy amount of expense is involved in installing a costing system. It is often argued that cost involved in installing the system will enhance cost

of production, but it actually reduces cost of production through cost control.

(b) Costing system meant for the organisation may not suit the organisation at all. If the nature of the business is studied and a costing system suitable for the business is installed, this criticism does not stand. Costing system is to suit the business and not vice versa.

(c) Employees often resist installation of a cost system. This is due to ignorance on the part of the employees and their suspicion. If employees are properly educated so that they are in a position to understand the benefits that accrue to them, no such resistance shall be forthcoming.

(d) Instances of failure in many cases are often cited. Failure of a cost system may be due to defective procedure or due to rejection of the advice of the Cost Accountant by the management or due to both. If methods and procedure are properly established and if the management accepts and acts upon the advices received from costing department, there is little chance of failure.

(e) When the old industries prospered without the help of a costing system why the modern industries should require it ? Old industries did not have to face keen competition as the modern industries have to face now. So, a costing system is essential now, just to keep the cost within control, in order to enable the industry to stand competition.

(f) Monotonous work of costing system is another criticism. Where is the absence of monotony ? Is it not present even in daily life ? In a costing system, only forms and statements are to be prepared – this is a statement made by many critics. This statement may be partially true, but there is also much more interesting side of costing system which requires research mentality.

The above criticisms are not against the science of Cost Accounting, but against a particular sytsem. The main criticisms i.e., over-elaboration, heavy costs of carrying a costing system, workers' resistance, delay in reporting, serious mistakes etc. can be avoided. There may be defects and inefficiency in any costing system, but the cost accountant may not be responsible for all. Lack of co-operation from management is also responsible. If a costing system is developed with full co-operation from the management, so as to suit the industry, it must outweigh the cost and other criticisms by its favourable effect on the industry. One should remember, in this connection that, a costing system must suit the industry and not vice versa.

The real limitations of costing system may be summarised as below :

(i) Cost statistics relate to past performances, whereas all decisions are to be taken about the future.

(ii) The cost of previous year may not continue to be the same in the current or future year due to price variations.

(iii) The cost ascertained on the basis of full utilisation of capacity may not be true when utilisation is only partial, for any reason.

(iv) Non-inclusion of some cost (notional in nature) may reduce cost. Different methods used in pricing the materials and in absorption of overheads may result in different costs.

(v) Management may believe that detailed records may give benefit, but they are costly too.

(vi) Various management problems may be solved by value analysis, work study, time and motion study, operation research and other cost reduction techniques. Cost accounting fails to tackle such problems.

(vii) To maintain all records for control under a costing system is also very expensive.

(viii) Delay in receiving costing information does not help the management to take decision at the right moment.

(ix) Rigid costing does not serve all purposes.

There are some misunderstanding about a costing system. Let us examine them.

(1) **A small-scale industrialist cannot afford to have a costing system.** Where the benefit from the costing system exceeds the cost of installing the system, any industrialist, small or big, can afford. A costing system shall first select the most profitable product by factors analysis. At the beginning, help from a cost consultant can be taken. Then a part time cost accountant may be employed to train the existing staff for a simple costing system.

(2) **If there is a control on material usage, labour losses, gains, expenses, losses and scraps, the costs can be more or less left to look after themselves.**

The areas of control mentioned in the statement cover almost everything, but piece-meal checks on those areas shall not be sufficient. Control must be established in an integrated manner and co-ordination must be established between all the spheres of activities. The best controlling measures are installing budgetary control and standard costing system.

(3) **Costing has reached its limit of usefulness.** This statement is never true. Even though operation research, computer system etc. have been developed, they are not considered as substitutes for a costing system, rather they are considered complementary to it. In India, costing system is yet to enter many industries.

(4) **A monopolist may not need a costing system.** It is true that a monopolist enjoys a special market position. He fixes his own price and buyers are obliged to accept that. Still, the monopolist may be afraid of substitutes, Government intervention etc. if the price goes too high. Thus, efficient control of costs is equally important in monopoly organisations also.

INSTALLATION OF A GOOD COSTING SYSTEM

Different industrial undertakings have different problems. To suit the specific needs of an industrial undertaking, the system of costing should be developed and applied. Thus, a system applicable in one undertaking may not be suitable in another undertaking. While designing a costing system in any undertaking the following broad principles should be borne in mind :

(a) **Least disturbance.** By introducing a costing system the present working of the organisation should be disturbed as little as possible. At the same time, the specific requirements of the organisation must also be fulfilled.

(b) **Creation of faith.** The executives and the workers should have faith in the system in order to create benefits out of that. Faith can be created by making the expected benefits known to them and allowing them to believe that prospect of the organisation leads to the prospect of all connected with it.

(c) **Simplicity.** The system should be simple to understand, so that the persons placed to work on the system can have a clear idea about the system.

(d) **Easy applicability.** Sometimes the system may be simple to understand, but difficult to apply. The system must be easy to apply also, because easy applicability with sincere application leads to success.

(e) **Gradual application.** The system should be applied step by step i.e., in phases. Hasty application causes disruption in work and ultimately ends in failure.

(f) **Economy.** The personnel pattern, records and forms etc. should be so designed as to involve minimum cost. It does not mean that efficiency should be surrendered to economy. So, essential forms and records as well as personnel must be maintained and unnecessary details should be eliminated.

PREREQUISITES OF A GOOD COSTING SYSTEM

The points that are to be carefully considered before installing a costing system may be described as the prerequisites and these prerequisites must be fulfilled in order to derive the best benefit out of the system. The points are as below :

(a) *Consideration of the size, layout and nature of the undertaking* : The size, layout and nature of the undertaking shall decide the requirements and the proposed costing system should suit such requirements. The cost of the costing system must not outweigh the expected benefits. On the other hand, the benefits should be much more than the cost involved. Industries

which manufacture goods and services require cost accounting. Trading concerns which purchase and sell finished goods require little cost accounting service. A big manufacturing concern, with complicated manufacturing activities, must not do well with a costing system designed for a simple small manufacturing concern.

(b) *Study of the production nature, methods and stages* : The nature of production, the methods of production and the stages of production shall determine the method of costing to be applied. The system of costing is to be developed in such a way that, cost at every stage of production can be built up.

(c) *Study of the organisational activities* : The present activities relating to the control of materials and wages and also to the control of expenditure should be carefully studied. If there is any defect or loop-holes they should be modified so as to suit the costing system.

(d) *Study of the present departments and their work* : Normally, every manufacturing organisation has manufacturing department, administrative department, selling department and distribution department. The present working efficiency of all these departments, their co-ordination etc. are to be studied. Inefficiency at any stage should be pointed out and improvement thereof should be suggested.

RESISTANCE AGAINST INTRODUCTION OF A COSTING SYSTEM

Introduction of a costing system often faces resistance from various angles. The nature of such resistance is discussed below :

(a) *Resistance from the point of view of cost* : Sometime a responsible minister stated "no more cost by introducing costing compulsorily". This is sometimes true, because the operating costs of the system sometimes outweigh the benefits. This state of affairs is unhappy, but where the design of the system does not match the requirements, this will only happen. When the system shall be appropriately suited to the requirements, the benefit derived from the system must always outweigh the cost of its operation. So, in that case, cost-burden does not become a point.

(b) *Resistance from the existing staff*: It is normal that existing staff shall always revolt against introduction of any new system. They think that the system is being introduced to keep watch on their activities and they are going to be under another new management, in addition to the existing one. This idea comes out of ignorance and suspicion. If they can be taught properly the resistance can be easily overcome.

(c) *Resistance from Management staff* : Managers often do not like the introduction of a costing system. They think that costing system shall curb their rights and they may be subject to 'efficiency accounting' under a costing system. Under a costing system, location of responsibility is definite

and in case of a failure, the fault can be detected and person responsible can be identified. Managers should accept the challenge and wo.k perfectly for the improvement of the organisation.

(d) *Resistance from the point of view of the dirth of trained staff* : Sometimes a costing system cannot be introduced due to non-availability of sufficient number of trained staff. For cost recording, cost analysis, cost control, cost reconciliation, cost statistics etc. expert hands are required. In our country there is a shortage of such hands. However, the number of such hands is increasing steadily. This will not stand in the way in near future.

METHODS OF COSTING AND TYPES OF COSTS

There are various methods or types of costing, but the basic principles underlying all these methods or types are the same. The basic principles are to collect and analyse the expenditure according to the elements of costs and to determine the cost for each cost centre and/or cost unit. The nature of the manufacturing operation carried out or the nature of the services rendered by a concern decides the method applicable to it. Broadly speaking, there are three main methods of costing—**Job costing, Process costing and Farm costing,** the others are either variants of these three methods or are techniques used for a particular purpose under particular conditions. All the methods which combine the features of basic costing systems are, according to J. Batty, *hybrid costing* systems.

1. Job Costing : Under this method, the cost unit is taken to be a job, small or big, comprising of a definite quantity of a product manufactured. Job costing system is used where it is desired to ascertain the cost of a job or a specific order or of a batch of finished goods and also profit or loss on each such job. Thus, printers, publishers, machine tool manufacturers, caterers, job foundries, painters etc. use job costing system.

[**N. B.** The approach of job costing system is *Product approach* i.e., emphasis is given on the job and costs of products in a job are ascertained. The approach of process costing and farm costing is *Period approach* i.e., emphasis is given on the period or time and costs incurred during a period are ascertained and are divided by the number of units produced to obtain unit cost.]

The variants of job costing are the following :

(a) *Batch Costing* : Here the cost of a group of products is ascertained. A group or batch of identical production units is taken as a cost unit. (Under pure job costing, a single job or order is taken as a cost unit.) Batch costing is used by engineering factories producing components or spare parts in economical batches and also by factories which produce a small number of items, but each item on mass scale (furniture, medicine, garments, toys, packed food, biscuits etc.).

(b) *Terminal or Contract Costing* : Here the cost unit is a contract. The cost of the contract and profit thereon are ascertained. The execution period of the contract may extend over a number of years. Building and construction engineering concerns and shipbuilders use contract or terminal costing.

(c) *Multiple or Composite Costing.* Industries which produce a number of components and then assemble them into a final complete product, use multiple or composite costing. Cost of each component is ascertained and the cost of assembly is also ascertained separately. In batch costing, the cost of assembly is not to be ascertained, because no assembly is done. Multiple or composite costing is used by industries like automobile, bicycle, aeroplane, radio receiver, locomotive, air-conditioners, etc.

2. **Process Costing** : Where manufacturing is carred out as a continuous process, process costing is used. Cost during a period, departmentwise or processwise, is determined. This cost being divided by the number of units of output during the same period gives the unit cost. Industries like refineries, chemical, cement, sugar, pharmaceutical, gas and electricity generating concerns, steel industries, soap industries, leather industries etc. use process costing.

Variants of process costing are the following :

(a) *Single or Output Costing* : Industries which produce only a single uniform product or a very small number of similar products or a single product of different grades, use single or output costing. Here the approach is period approach. The period cost being divided by the number of units produced, gives the unit cost. Iron & Steel Industries, breweries, collieries, mines and quarries etc. use single or output costing.

(b) *Operation Costing* : Here, instead of the process, each operation is taken as the cost centre. In industries where the production is carried out by a number of distinct operations, operation costing is suitably used. If in the manufacture of a particular product there are four distinct operations and the operation unit costs are a, b, c and d, the cost of the finished unit is determined by $a+b+c+d$.

(c) *Operating Costing* : The approach of operating costing is period approach. It is used in those concerns which render 'services' and do not manufacture goods. Educational institutions, hospitals, transport companies, railways, power houses etc. use operating costing. The respective cost units are—a student, a bed, a passenger-kilometre/ton-kilometre, a kilowatt-hour etc. The cost of an educational institution during a period is ascertained and is divided by the number of students to obtain unit cost. Similarly, unit cost of other concerns is determined. Operating costing may be regarded as a separate type owing to its distinct nature, but it may also be regarded as a variant of Process Costing.

3. **Farm Costing** : The agricultural farms are quite different from the manufacturing industries in many respects. Manufacturing industries use standard plants which give standard output. Plant of a farm is the land which varies widely from place to place and in soil structure. Produce of a farm is highly influenced by climate, rainfall, irrigation, nature of manuring, nature of labour used at different stages from sowing to harvesting, nature of seeds used etc. Manufacturing products are not influenced by these factors. Another peculiarity of a farm is that, output of a period, in part at least, is used as the input of the period following. Paddy, potato, onions etc. produced in one year are preserved for using them as seeds in the next year.

Thus, owing to the peculiar nature of farms, as distinct from that of manufacturing concerns, a new costing method has been applied to farms so as to suit their purpose and is known as *farm costing.* The countries which depend on agriculture mainly and are developing agriculture through organised farms, suitably use farm costing. The approach of farm costing is period approach. When only one crop is produced the period cost being divided by the number of units produced gives the unit cost. When more than one crop is produced or where there is rotation of crops, unit cost is ascertained after proper allocation of expenses to different crops.

TECHNIQUES OF COSTING

Within the methods of costing, different *techniques* may be used for ascertaining cost. These techniques may be grouped under the following heads :

(a) *Historical or Absorption Costing* : Costs which are ascertained after they have been incurred are historical costs. Historical costing may be found to be similar to diagnosing a disease by postmortem analysis. This is the traditional costing. So far as cost control is concerned, historical costing does not bear much value.

(b) *Predetermined Cost* : Costs which are ascertained before they have been actually incurred, are predetermined costs. This is like writing Ramayana much before the birth of Rama.

On the basis of specification of all the factors affecting costs, cost of each element is ascertained, in advance, before the actual production. The actual cost, after it is incurred, is compared with the corresponding predetermined cost and the difference is analysed with reasons, so that management may take remedial measures in time.

Predetermined cost may be ascertained under (i) *Estimated Costing* or under (ii) *Standard Costing.* Under the former, cost of each element is determined, in advance, on the basis of estimates ; while in the case of Standard Costing, Standards are set for each element and for each product process or service, and actual cost is compared with predetermined standard and the *variance* (i.e., differences) with reasons are worked out so as to .

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enable the management to take timely action. Estimated cost is less accurate than standard cost.

(c) *Marginal Costing* : Under this cost technique, costs are classified into fixed costs and variable costs. Total of variable costs of a unit is called marginal cost. Fixed costs are recovered from *contribution* which is the excess of selling price over marginal cost. Marginal costing is very useful for managerial decision, particularly in times of acute competition while taking 'make or buy' decision, selecting appropriate product-mix, taking 'shut down' decision etc.

(d) *Uniform Costing* : Costing principles and/or practices being uniformly followed by a number of undertaking under common control may be known as uniform costing. Different factories under one management use the same principles and/or practice of costing so as to facilitate rational comparison of efficiency. Uniform costing is, therefore, a technique for studying comparative efficiency and for promoting efficiency. Factories under different ownership, but under industrial combination, may also follow uniform costing for the same benefit. Even, the scope of uniform costing may be extended to firms in different countries.

(e) *Opportunity Cost* : Men, material, finance etc. may be used in different ways. When used in a particular way they give a particular return. If the same are used in different way they may give the *same or a different return. The original return which is no longer obtainable is the opportunity cost. For example, Rs. 10,000 invested in some investment gives an annual income of Rs. 1,000. The investment is realised at par and put into a business. The opportunity cost is Rs. 1,000 i.e., the interest lost. Opportunity cost never finds place in the books of accounts, but it is taken into consideration for the purpose of comparison.

(f) *Incremental or differential Cost* : When a change is made in the level of output or in product-mix or in pattern of production or in method of production, the resulting increase in total cost is called incremental cost. It is important to ascertain incremental cost in order to judge the desirability of effecting the change from the point of view of cost, revenue and profit.

(g) *Out-of-pocket Cost* : When the payment for an element is not required to be made to third party (as for example, depreciation) and is excluded from the total cost, the cost is called out-of-pocket cost. This is important for the purpose of price fixation during trade depression, for taking 'make or buy' decision etc.

(h) *Imputed Cost* : Imputed costs are hypothetical notional costs not involving payment in cash or kind. For example, interest on own capital, rent of own building, salary to the proprietor-manager etc. are not required to be paid. But these costs are taken into consideration for the purpose of comparison. Imputed cost does not find place in accounts,

but is considered for the purpose of comparison, as in case of opportunity cost.

EXERCISES

Theoretical :

1. What is meant by Cost Accounting ? How does Cost Accounting differ in technique and procedure from Financial Accounting ?

2. What is Cost Accounting ? How is it related to Financial Accounting ? What are the limitations and deficiencies of Financial Accounting ?

3. What is Costing ? What are its objects and advantages ?

<div align="right">(C. U., B. Com. Pass '86)</div>

4. Critically examine the need and importance of Cost Accounting with reference to the inadequacies of Financial Accounts.

5. 'Cost Accounting has become an essential tool of management'.—Give your comment on the statement. (G. U., B. Com. Pass '85)

6. State briefly what are the main advantages of Cost Accounting in an industry which are not derived from the traditional accounting system.

<div align="right">(G. U., B. Com. Pass '85)</div>

7. How is Cost Accounting related to Management Accounting ?

8. What is a cost centre ? State briefly the different types of cost centres.

9. What do you mean by cost units ? Mention some usual cost units used in various industries.

10. Briefly state the principal objections usually made to the installation of a costing system. How you would propose to answer these objections ?

11. What are the characteristics of a good costing system ?

12. Describe in brief the various methods of costing and state the industries in which each one of them can be applied.

13. Explain the following :
    (a) Historical costing ;   (b) Marginal costing ;   (c) Uniform costing ;
    (d) Standard costing.   (C. U., B. Com. Hons.)

14. Give a brief description of the following and mention the names of at least two industries in which each of these could be employed :
    (i) Job costing ; (ii) Batch costing ; (iii) Process costing ; (iv) Operating costing ; (v) Multiple costing ; (vi) Operation costing.

<div align="right">(C. U., B. Com. Hons.)</div>

15. What method of costing would you recommend for the following industries ? Give reasons :
    (i) Ship-building industry ; (ii) Toy-making industry ; (iii) Oil Refinery ;
    (iv) Sugar industry ; (v) Radio Receivers industry.

16. Mention with reasons the type of costing you will adopt in the following industries :
    (i) Cement manufacturing ; (ii) Soap manufacturing ; (iii) Railways ;
    (iv) Bi-cycle manufacturing ; (v) Printing and (vi) Publishing.

17. Narrate how cost accounting evolved as a new branch of accounting.

18. What do you mean by hybrid costing system ?

Elements of Cost and Cost Sheet

Raw materials are converted into finished products by a manufacturing concern with the help of labour, plants etc. The elements that constitute the cost of manufacture are known as the elements of cost. The elements of cost are—(a) Material, (b) Labour and (c) Expenses. Each of these elements are again sub-divided into direct and indirect.

Direct material, direct labour and direct expenses are those which can be traced in relationship with a particular process, job, operation or product. Indirect material, indirect labour and indirect expenses are those which are of general nature and cannot be traced in relationship with a particular process, operation, job or product.

Direct Material
Direct Labour   together constitute *Prime Cost*
Direct Expenses

Indirect Material
Indirect Labour   together constitute *Factory* or *Works Overhead*
Indirect Expenses

Prime Cost + Factory or Works Overhead = *Factory Cost or Works Cost*

Factory Cost + Administration Overhead = *Cost of Production*

Cost of Production + Selling and Distribution Overhead
= *Total Cost or Cost of Sales*

While working out the Cost of Sales further details as below are to be kept in mind :

		Rs.
	Opening stock of raw materials	x x x x
Add :	Purchase of raw materials	x x x x
		x x x x
Less :	Closing stock of raw materials	x x x x
	Raw materials consumed	x x x x
Add :	Direct wages	x x x x
	Direct expenses	x x x x
	Prime Cost	x x x x
Add :	Factory overhead	x x x x
Add :	Opening work-in-progress	x x x x
		x x x x
Less :	Closing work-in-progress	x x x x
	Factory Cost or Works Cost	x x x x
Add :	Office and administration overhead	x x x x
	Cost of Production	x x x x
Add :	Opening finished stock	x x x x
		x x x x
Less :	Closing finished stock	x x x x
	Cost of production of goods sold	x x x x
Add :	Selling overhead	x x x x
Add :	Distribution overhead	x x x x
	Total Cost or Cost of sales	x x x x
	Profit	x x x x
	Selling price	x x x x

[*Note :* When work-in-progress (i.e., partly finished goods) is valued at factory cost (i.e., Prime Cost + Proportionate factory overhead) the above is the way of

finding selling price step by step. When work-in-progress is valued at prime cost, proportionate factory overhead applicable to work-in-progress is transferred to a separate account called "Overhead on work-in-progress A/c". In this case opening work-in-progress is added with and closing work-in-progress is deducted from the total of direct material, direct wages and direct expenses to find out prime cost, while overhead on opening work-in-progress is added with and overhead on closing work-in-progress is deducted from the factory overhead to find out factory overhead relevant to production for the period.]

Before going to learn how to prepare Cost Sheet i.e., Statement of Costs, let us have some idea about the different elements of cost mentioned above.

Direct Material. It refers to material out of which the product is manufactured, for example, leather shoes are produced out of leather, butter is produced out of milk, steel utensils are produced out of stainless steel and so on. Thus, leather, milk and stainless steel are the direct materials for the manufacture of shoes, butter and steel utensils respectively. More than one material may be directly required for a production. For example, if somebody wants to manufacture water, his direct materials are hydrogen and oxygen.

As against direct materials another kind of material may be required in the process of manufacture, but not directly. For example, machines used for production require mobile, jute & cotton wastes etc. These are indirect materials.

While direct material is a component of prime cost, indirect material is a component of factory overhead. Direct material directly varies with the output, but indirect material may not so vary.

Direct Wage. It refers to the wages paid to the workers who actually produce the goods. In case of manual work it is not difficult to locate the direct worker, because he is one who produces the goods. In case of work done by the machine, the person who makes the input and collects the output and in whose account the output is credited for the purpose of payment of wage, is the direct worker.

There are several other workers in the factory who help the direct workers in connection with their work with regard to supply of material, power etc. and in respect of supervision and maintenance. These are indirect workers. Wages of indirect workers at different stages of production are indirect wages. Direct wage is a component of prime cost, while indirect wage is a component of factory overhead. The former directly varies with the output while the latter may not so vary.

Direct Expense. Besides direct material and direct labour, certain expense may be wholely and exclusively necessary for a prodution. This expense is referred to as direct expense. For example, if an order is received to manufacture 1,000 pieces of plastic balls with the customer's name embossed on them, the manufacturer shall have to prepare a mould exclusively for this purpose. The cost of the mould may be regarded as the direct expense for

the production.   Similarly, charge for hire of a special plant for production is also a direct expense.   Cost of preparing blue print for production is another example of direct expense.

[*Note* :   Carriage for bringing direct material is a part of direct material cost.]

Overhead.   Overhead refers to the indirect expenses incurred at various levels of activities of the enterprise.

The classification of overhead expenses according to functions may be done as below :

(i) *Factory or works overhead* :   It refers to all indirect expenses of the factory.   This includes, wages of all factory staff excluding those of direct workers : indirect material, rent, rates and taxes of factory ; depreciation of factory assets ; royalty on production (unless treated as direct expense) ; excise duty ; canteen expenses : labour welfare expenses etc.

(ii) *Administration overhead* :   It refers to all expenses incurred in connection with general administration.   Salary of the administrative staff ; rent, rates, taxes of administrative accommodation ; postage, telegram and telephone ; stationery, lighting of administrative building ; depreciation of office appliances etc. are included in administration overhead.

(iii) *Selling overhead* :   It refers to all expenses incurred in connection with sales.   Thus, salary of sales staff ; traveller's commission ; advertisement ; rent, rates, taxes of sales office ; depreciation of sales office appliances ; cost of participation in industrial fares and exhibitions ; cost of free gifts ; cost of free after-sales service ; bad debts within normal limit etc. are included in selling overhead.

(iv) *Distribution overhead* :   It refers to all expenses incurred in connection with delivery of the product after sale at the cost of the producer. Thus, delivery van expenses ; freight and insurance ; packing for delivery ; loading and unloading ; salary of the deliverymen ; customs duty etc. are included in distribution overhead.

Classification of overhead expenses according to behaviour may be done as below :   Overhead expenses that vary proportionately with the output are *variable overhead*.   Overhead expenses that remain fixed irrespective of change in the level of output are *fixed overhead*.   Overhead expenses that vary with the output, but not proportionately, are *semi-variable overhead*.

It must be remembered in this connection that direct material, direct wage and direct expenses are *variable items of direct cost*.   Therefore, *if we like to classify cost according to behaviour* we get the following classifications :

1. *Fixed Costs* :   Fixed costs include only those overhead expenses which remain fixed irrespective of the level of output.   Rent and rates of building ; salary of the works manager, administrative manager, sales manager etc. ; Depreciation of building ; insurance ; interest on capital (if included in cost) etc. are items of fixed costs.

2. *Variable Costs* : Variable costs include prime cost and variable overheads. These costs vary proportionately with the output. Direct material ; direct wage ; direct expense : consumable stores ; power, fuel etc. are items of variable cost.

3. *Semi-variable Costs* : These include overhead expenses that vary according to output, but not proportionately. So, these costs are partly fixed and partly variable. Examples of semi-variable costs are normal repair and maintenance of building and plant ; salary of supervisors, chargemen, foremen etc. : service department expenses : depreciation of plant and machinery etc. To take a concrete example let us consider the e'ement 'repair'. Normal repair is largely fixed in nature, because within certain degree of capacity utilization normal repair is a routine matter at regular intervals. When utilization is beyond that certain degree, more frequent repair shall be necessary involving further cost ; but still, such increase in cost shall not be proportionate to the increase in output. This is why the element is semi-variable.

It is important to know the classification of cost behaviourwise, because the total of the variable costs per unit of output is known as *marginal cost*. Marginal cost represents the cost incurred in producing one extra unit. If one extra unit is to be produced, the fixed costs will not increase, only the variable costs shall come into the picture. (Here, the semi-variable costs are to be further classified into fixed and variable and thus, there shall be only two classification for the purpose).

WORKED-OUT PROBLEMS

Problem 1.

A manufacturer has shown an amount of Rs. 16,190 in his books as "Establishment" which really includes the following expenses :

Agents' commission Rs. 5,750 : Warehouse wages Rs. 1,800 ; Warehouse repairs Rs. 510 ; Lighting of office Rs. 70 ; Office salaries Rs. 1,130 ; Directors' remuneration Rs. 1,400 ; Travelling expenses Rs. 760 ; Rent, rates & insurance of warehouse Rs. 310 ; Rent, rates & insurance of office Rs. 230 ; Lighting of warehouse Rs. 270 ; Printing & stationery Rs. 1,500 ; Trade magazines Rs. 70 ; Donations Rs. 150 ; Bank charges Rs. 100 : Discount allowed Rs. 1,970, Bad debts 170.

From the above information, prepare a statement showing in separate totals (a) Selling expenses, (b) Distribution expenses, (c) Administration expenses and (d) Expenses which you would exclude from total costs.

Solution :

Statement of Cost

			Rs.	Rs.
(a)	**Selling expenses :**			
	Agents' commission	...	5,750	
	Travelling expenses[1]	...	760	
	Bad debts[2]	...	170	
				6,680
(b)	**Distribution expenses :**			
	Warehouse wages	...	1,800	
	Warehouse repairs	...	510	
	Rent, rates & insurance of warehouse	...	310	
	Lighting of warehouse	...	270	
				2,890
(c)	**Administration expenses :**			
	Lighting of office	...	70	
	Office salaries	...	1,130	
	Directors' remuneration	...	1,400	
	Rent, rates & insurance of office	...	230	
	Printing & stationery	...	1,500	
	Trade magazines	...	70	
	Bank charges[3]	...	100	
				4,500
	Total expenses to be considered in estimating costs			14,070
(d)	**Expenses to be excluded from costs**			
	Donations	...	150	
	Discount Allowed[4]	...	1,970	
				2,120
	Total			16,190

Notes : [1]It has been assumed that travelling expenses have been incurred in connection with sales.

[2]Bad debts may be regarded either as an element of selling expense or as an element of administration expense, and the choice of any one of the two methods will depend entirely upon the routine in regard to the passing or certifying the inward order for credit. If the Selling Dept. is responsible for this work, the loss is correctly an element of selling expense, but in those cases where a separate Credit Dept. exists and is under the charge of either the secretary or accountant, the item constitutes an element of administrative expense. Bad debt of abnormal amount is, however, excluded from cost.

[3]When charges are made by a bank for handling the account, the amount will form part of the establishment expenses and be allocated to administrative expense.

[4]Discount allowed may be regarded merely as interest paid to secure cash resources and therefore, purely a matter of finance. If this view is taken, the discount must be excluded from Cost Accounts in the same manner as other interests are excluded. If, on the other hand, it is decided to include discount allowed in Cost Accounts, it should be considered as a part of selling overhead.

Problem 2.

The accounts of P. K. Manufacturers Ltd. for the year ending on 31st December, 1985, show the following :

	Rs.
Stock of materials on 1st January, 1985	67,200
Materials purchased	2,59,000
Bad debts written off	9,100
Travellers' salaries and commission	10,780
Depreciation written off on office furniture	420
Rent, rates, taxes and insurance (factory)	11,900
Productive wages	1,76,400
Directors' fees	8,400
General expenses	4,760
Gas and water (factory)	1,680
Travelling expenses	2,940

		Rs.
Sales		6,00,000
Manager's salary (2/3rd. for factory, 1/3rd. for office)		15,000
Depreciation on plant and machinery		18,200
Cash discounts allowed		4,060
Repairs to plant and machinery		6,230
Carriage and cartage outwards		6,020
Direct expenses		10,010
Rent, rates and insurance (office)		2,800
Gas and water (office)		560
Stock of materials as on 31st December, 1985		87,920

Prepare a statement giving the following information : (i) Materials consumed ; (ii) Prime cost ; (iii) Factory cost ; (iv) Cost of production ; (v) Cost of sales ; (vi) Net profit. It is desired not to include cash discount in cost.

Solution :

Statement of Cost		Period : *year ended 31.12.85*

		Rs.	Rs.
Materials Consumed :			
Opening stock	...	67,200	
Purchases	...	2,59,000	
		3,26,200	
Less : Closing stock	...	(87,920)	
			2,38,280
Productive wages	...		1,76,400
Direct expenses	...		10,010
Prime cost	...		4,24,690
Factory expenses :			
Rent, rates, taxes and insurance	...	11,900	
Gas and water	...	1,680	
Manager's salary ($\frac{2}{3} \times 15,000$)	...	10,000	
Depreciation on plant and machinery	...	18,200	
Repairs to plant and machinery	...	6,230	
			48,010
Factory cost	...		4,72,700
Office and administration expenses :			
Directors' fees	...	8,400	
General expenses	...	4,760	
Manager's salary ($\frac{1}{3} \times 15,000$)	...	5,000	
Rent, rates and insurance	...	2,800	
Gas and water	...	560	
Depreciation on furniture	...	420	
			21,940
Cost of production	...		4,94,640
Selling and distribution expenses :			
Traveller's salaries and commission	...	10,780	
Travelling expenses[1]	...	2,940	
Bad debts	...	9,100	
Carriage and cartage outwards	...	6,020	
			28,840
Cost of sales	...		5,23,480
Net Profit (*balancing figure*)	...		76,520
Sales	...		6,00,000

Note : [1]It has been assumed that travelling expenses have been incurred in connection with sales.

Problem 3.

The following figures are extracted from the books of a manufacturing company for the year ended 31st March, 1985. Prepare a cost sheet showing clearly the cost per unit under the various elements and also the profit/loss per unit.

	Rs.
Direct materials	25,00,000
Direct labour	8,00,000
Depreciation of factory building	16,000
Branch office expenses	30,000
Depreciation of office building	10,000
Depreciation of staff cars	15,000
Insurance :	
Staff cars	2,000
Office building	1,500
Factory building	2,000
Delivery van—maintenance and running expenses	12,000
Salaries (including that of Sales Manager Rs. 20,000 and	
Factory Chief Engineer Rs. 25,000)	2,75,000
Finished goods warehouse expenses	15,000
Electricity (including Rs. 5,000 for administrative office)	35,000
Advertisement	18,000
Sundry factory expenses	4,20,000
Sales promotion	4,000
Office administration expenses	60,000
Expenses for participating in industrial exhibition	8,000
Sales (10,000 units)	50,00,000
Units produced—10,000	

Solution :

Cost Sheet

Output : *10,000 units*   Period : *year ended 31-3-85*

		Total		Per unit	
		Rs.	Rs.	Rs.	Rs.
Direct materials	...		25,00,000		250·00
Direct labour	...		8,00,000		80·00
Prime cost	...		33,00.000		330·00
Works overhead :					
Depreciation of factory building	...	16,000		1·60	
Insurance of factory building	...	2,000		0·20	
Salary of factory chief engineer	...	25,000		2·50	
Electricity (35,000−5,000)	...	30,000		3·00	
Sundry factory expenses	...	4,20,000		42·00	
			4,93,000		49·30
Works cost	...		37,93,000		379·30
Office and administration overhead :					
Depreciation of office building	...	10,000		1·00	
Depreciation of staff cars	...	15,000		1·50	
Insurance of staff cars	...	2,000		0·20	
Insurance of office building	...	1,500		0·15	
Salaries (2,75,000 20,000−25,000)	...	2,30,000		23·00	
Electricity	...	5,000		0·50	
Other office administration expenses	...	60,000		6·00	
			3,23,500		32·35
Cost of production	...		41,16,500		411·65
Selling and distribution overhead :					
Sales manager's salary	...	20,000		2·00	
Advertisement	...	18,000		1·80	
Sales promotion	...	4,000		0·40	
Expenses in industrial exhibition	...	8,000		0·80	
Branch office expenses	...	30,000		3·00	
Finished goods warehouse expenses	...	15,000		1·50	
Delivery van—maintenance and					
running expenses	...	12,000		1·20	
			1,07,000		10·70
Cost of sales	...		42,23,500		422·35
Profit (*balancing figure*)	...		7,76,500		77·65
Sales	...		50,00,000		500·00

Problem 4

From the following figures prepare separate statements of cost and profit for the month of October, 1985 :

	Rs.
Stock on 1st October, '85 :	
Raw materials	60,600
Finished goods	35,900
Stock on 31st October, '85 :	
Raw materials	75,000
Finished goods	30,900
Work-in-progress :	
On 1st October, '85	1,25,600
On 31st October, '85	1,42,200
Purchase of raw materials	2,85,700
Sale of finished goods	13,40,000
Direct wages	3,75,000
Factory expenses	2,12,500
Office and administration expenses	1,03,400
Selling and distribution expenses	75,000
Sale of scrap	2,600

Solution :

Statement of Cost of Production

Period : October, 1985

		Rs.	Rs.
Materials consumed :			
Opening stock	...	60,600	
Purchases	...	2,85,700	
		3,46,300	
Less : Closing stock	...	(75,000)	2,71,300
Direct wages	...		3,75,000
Prime cost	...		6,46,300
Factory expenses	...	2,12,500	
Less : Sale of scrap	...	(2,600)	2,09,900
			8,56,200
Adjustment for work-in-progress :			
Opening	..	1,25,600	
Closing	...	1,42,200	(16,600)
Works cost	...		8,39,600
Office and administration expenses	...		1,03,400
Cost of production	...		9,43,000

Statement of Profit or Loss

Period : October, 1985

		Rs.
Stock of finished goods on 1st October, '85	...	35,900
Add : Cost of production	...	9,43,000
		9,78,900
Less : Stock of finished goods on 31st October, '85	...	(30,900)
Cost of goods sold	...	9,48,000
Selling and distribution expenses	...	75,000
Cost of sales	...	10,23,000
Profit (*balancing figure*)	...	3,17,000
Sales	...	13,40,000

Note : Office and administration expenses may be included in the Statement of Profit or Loss as shown in the next problem.

Problem 5.

The SUSAN Company makes art prints. The following details are available for the year ended 30th June, 1987 :

		Rs. (*thousands*)
Opening stocks : Direct materials		26
	Work-in-progress	74
	Finished goods	120
Direct materials purchased		436
Direct labour		120
Indirect labour and supervision		44
Administrative expenses		160
Factory rent, rates and insurance		94
Depreciation of factory equipment		70
Selling expenses		140
Factory power, heat and light		20
Sundry factory overheads		12
Financial charges		120
Sales		1,460
Closing stocks : Direct materials		42
	Work-in-progress	54
	Finished goods	80

The company values work-in-progress at factory cost.

You are required to prepare :

(a) A schedule of cost of goods manufactured for the year ended 30th June, 1987.

(b) A profit statement for the year ended 30th June, 1987.

Solution

Schedule of Cost of Goods Manufactured

Period : year ended 30th June, 1987

		Rs. (thousands)	Rs. (thousands)
Direct materials consumed :			
Opening stock	...	26	
Purchases	...	436	
		462	
Less : Closing stock	...	(42)	
			420
Direct labour	...		120
Prime cost	...		540
Factory Overhead :			
Indirect labour and supervision	...	44	
Rent, rates and insurance	...	94	
Depreciation of equipment	...	70	
Power, heat and light	...	20	
Sundry	...	12	
			240
			780
Adjustment for work-in-progress :			
Opening	...	74	
Closing	...	(54)	
			20
Cost of goods manufactured	...		800

Profit Statement   *Period : year ended 30th June, 1987*

			Rs. (thousands)	Rs. (thousands)
Sales		...		1,460
Less : Cost of goods sold :				
	Opening stock of finished goods	...	120	
	Cost of goods manufactured	...	800	
			920	
	Less : Closing stock of finished goods	..	(80)	
				(840)
	Gross profit	...		620
Less :	Administrative expenses	...	160	
	Selling expenses	...	140	
	Financial charges	...	120	
				(420)
	Net profit	...		200

Problem 6.

A company is manufacturing refrigerators and the following details are furnished in respect of its factory operations for the year ended 31st December, 1985 :

	Rs.	Rs.
Work-in-progress 1st January, 1985		
At prime cost	51,000	
Manufacturing expenses	15,000	66,000
Work-in-progress, 31st December, 1985		
At prime cost	45,000	
Manufacturing expenses	9,000	54,000
Stock of raw materials, 1st January, 1985		2,25,000
Purchase of raw materials		4,77,000
Direct labour		1,71,000
Manufacturing expenses		84,000
Stock of raw materials on 31st December, 1985		2,04,000

On the basis of above data, prepare a statement showing the cost of production. Also indicate separately the amount of manufacturing expenses which enters into the cost of production.   (*C. U., B. Com. Hons.*)

Solution :

Statement of Cost of Production

Period : year ended 31st Dec. '85

		Rs.	Rs.
Raw materials consumed :			
Opening stock	...	2,25,000	
Purchases	...	4,77,000	
		7,02,000	
Less : Closing stock	...	(2,04,000)	
			4,98,000
Direct labour	...		1,71,000
			6,69,000
Adjustment for work-in-progress :			
Opening	...	51,000	
Closing	...	(45,000)	6,000
Prime cost	...		6,75,000
Manufacturing expenses	...	84,000	
Adjustment for work-in-progress :			
Opening	15,000		
Closing	(9,000)	6,000	
			90,000
Cost of production			7,65,000

Amount of manufacturing expenses that enters into Cost of Production is Rs. 90,000.

Problem

The accounts of the Steelways Engineering Co. Ltd. show for 1985 :

	Rs.
Materials used	1,80,000
Manual and machine labour wages directly chargeable	1,60,000
Works overhead expenditure	40,000
Establishment and general expenses	19,000

(a) Show the works cost and total cost, the percentage that the works overhead cost bears to the manual and machine labour wages and the percentage that the establishment and general expenses bear to the works cost.

(b) What price should the company quote to manufacture a machine which, it is estimated will require an expenditure of Rs. 8,000 on materials and Rs. 6,000 on wages so that it will yield a profit of 25% on the total cost or 20% on selling price.   (*C. U., B. Com. Hons.*)

Solution :

<div align="center">

Statement of Cost

Period : year ended 31st December, '85

</div>

		Rs.
Materials used	...	1,80.000
Manual and machine labour wages (directly chargeable)	...	1,60 000
Prime cost	..	3,40,000
Works overhead expenditure	...	40,000
Works cost	...	3,80,000
Establishment and general expenses	...	19,000
Total cost	...	3,99,000
Percentage of works overhead to manual and machine labour wages : $\frac{40,000}{1,60,000} \times 100$	...	25%
Percentage of establishment and general expenses to works cost : $\frac{19,000}{3,80,000} \times 100$	...	5%

<div align="center">

Statement of Estimated Cost for the manufacture of a machine

</div>

Enquiry from...............

		Rs.
Cost of materials	...	8,000
Direct wages	...	6,000
Prime cost	...	14,000
Works overhead : 25% of wages	...	1,500
Works cost	...	15,500
Establishment and general expenses : 5% of works cost	...	775
Total cost	...	16,275
Profit (20% on selling price or 25% on cost)	...	4,069
Price to be quoted	...	20,344

Date...........   *Prepared by............*

                                                  Checked by............

Problem 8.

From the following particulars prepare a statement in such form as you consider most suitable for showing clearly all elements of cost :

	Rs.
Opening stock of raw materials	25,000
Purchases of raw materials	70,000
Raw materials returned to suppliers	2,000
Closing stock of raw materials	18,800
Wages paid to—Productive workers	18,000
Non-productive workers	2,000
Salaries paid to office staff	5,000
Carriage on raw materials purchased	500
Carriage on goods sold	1,500
Rent and rates of workshop	2,500
Fuel, gas, water etc.	1,000
Repairs to plant	600
Depreciation on machinery	1,400
Office expenses	1,500
Direct chargeable expenses	800
Advertising	1,200
Abnormal loss of raw materials	1,200

(N. B. U., B. Com. Hons.—Adapted)

Solution :

Statement of Cost

Period...........

		Rs.	Rs.
Materials consumed :			
Opening stock	...	25,000	
Purchases	...	70,000	
Carriage on purchases	...	500	
		95,500	
Less : Returns	...	(2,000)	
		93,500	
Less : Abnormal loss[1]	...	(1,200)	
		92,300	
Less : Closing stock	..	(18,800)	
			73,500
Productive wages	.		18,000
Direct chargeable expenses	..		800
Prime cost	.		92,300
Works overhead :			
Non-productive wages	..	2,000	
Rent and rates of workshop	..	2,500	
Fuel, gas, water etc.	..	1,000	
Repairs to plant	..	600	
Depreciation on machinery	..	1,400	7,500
Works cost	..		99,800
Office overhead :			
Salaries to office staff	..	5,000	
Office expenses	..	1,500	6,500
Cost of production	..		1,06,300
Selling and distribution overhead :			
Carriage on goods sold	.	1,500	
Advertising	..	1,200	2,700
Cost of sales	..		1,09,000

Note : [1] Abnormal loss of materials should be excluded from cost and debited to Costing Profit & Loss A/c, hence it has been deducted from materials cost.

Problem 9.

The following data relate to the manufacture of a standard product during the four-week-period to June 30th, 1985 :

Raw materials consumed	Rs. 4,000
Wages	Rs. 6,000
Machine hours worked	1,000
Machine hour rate	50 paise
Office overhead	20% on works cost
Selling overhead	6 paise per unit
Units produced	20,000
Units sold	18,000 @ Re. 1 per unit

You are required to prepare a cost sheet showing the cost per unit and profit for the period.　　　　　(C. U., B. Com. Hons.)

Solution :

Cost Sheet

Output : 20,000 units　　　　　　　*Period : 4 weeks ended 30-6-'85*

		Total Rs.	Per unit Rs.
Raw materials consumed	...	4,000	0·200
Wages	...	6,000	0·300
Prime cost	...	10,000	0·500
Works overhead (1,000 hrs. @ Re. 0·50)	...	500	•0·025
Works cost	...	10,500	0·525
Office overhead (20% on works cost)	...	2,100	0·105
Cost of production	...	12,600	0·630
Less : Closing stock (2,000 units @ Re. 0·63)	...	(1.260)	—
Cost of goods sold (18,000 units)	...	11,340	0·630
Selling overhead (Re. 0·06 per unit on 18,000 units)	...	1.080	0·060
Cost of sales	...	12,420	0·690
Profit (*balancing figure*)	...	5,580	0·310
Sales	...	18,000	1·000

Problem 10.

The following figures for the month of April, 1985 were extracted from the records of a factory :

	Rs.
Opening stock of finished goods (5,000 units)	45,000
Purchase of raw materials	2,57,100
Direct wages	1,05,000
Factory overhead	100% of Direct wages
Administration overhead	Re. 1 per unit
Selling and distribution overhead	10% of sales
Closing stock of finished goods (10,000 units)	?
Sales (45,000 units)	Rs. 6,60,000

Prepare a cost sheet for the month of April, 1985, assuming that sales are made on the basis of 'first-in, first-out' principle.

　　　　　　　　　　　　　　　　　(C. U., B. Com. Hons.)

Solution :

Cost Sheet

Output : 50,000 units[1]   *Period : April, 198.*

		Total	Per unit
		Rs.	Es.
Raw materials	...	2,57,100	5·142
Direct wages	...	1,05,000	2·100
Prime cost	...	3,62,100	7·242
Factory overhead : 100% of Direct wages	. ..	1,05,000	2·100
Works cost	...	4,67,100	9·342
Administration overhead : Re. 1 per unit		50,000	1·000
Cost of production	...	5,17,100	10·342
Add : Opening stock of finished goods	...	45,000	
		5,62,100	
Less : Closing stock of finished goods :			
10,000 units @ Rs. 10·342[2]	...	(1,03,420)	
Cost of goods sold	...	4,58,680	10·193
Selling and distribution overhead @ 10% of sales	...	66,000	1·467
Cost of sales	...	5,24,680	11·660
Profit *(balancing figure)*	...	1,35,320	3·007
Sales	...	6,60,000	14·667

Working Notes :

[1]Production during the month=Sales 45,000 units+closing stock 10,000 units—opening stock 5,000 units=50,000 units.

[2]Since goods have been sold on FIFO basis the entire closing stock represents current production @ Rs. 10·342 per unit, because sales include all opening stock and part of current production.

[3]Per unit cost of goods sold Rs. 10·103 has been obtained by dividing Rs. 4,58,680 by 45,000 sales units.

Problem 11.

A manufacturing company submits the following information on 31st March, 1985 :

		Rs.
Sales for the year		2,75,000
Inventories at the beginning of the year	Rs.	
Materials	3,000	
Finished goods	7,000	
Work-in-progress	4,000	
Purchases of raw materials for the year		1,10,000
Direct Labour		65,000
Inventories at the end of the year :	Rs.	
Materials	4,000	
Work-in-progress	6,000	
Finished goods	8,000	

Other expenses for the year—

Selling expenses @ 10% of sales

Factory overhead @ 60% of direct labour cost

Administrative expenses @ 5% of sales

Prepare a statement of cost.   *(C. U., B. Com. Hons. Adapted)*

Solution :

Statement of Cost
for the year ended 31-3-1985

		Rs.	Rs.
Materials consumed :			
Opening inventory	...	3,000	
Purchases	...	1,10,000	
		1,13,000	
Less : Closing inventory	...	4,000	
			1,09,000
Direct labour	...		65,000
Prime cost	...		1,74,000
Factory overheads : 60% of direct labour cost	...		39,000
			2,13,000
Adjustment for work-in-progress			
Opening	...	4,000	
Closing	...	(6,000)	
			(2,000)
Cost of finished goods manufactured	...		2,11,000
Add : Opening inventory of finished goods	...		7,000
			2,18,000
Less : Closing inventory of finished goods	...		8,000
Cost of goods sold	...		2,10,000
Administration expenses : 5% of sales	...	13,750	
Selling expenses : 10% of sales	...	27,500	
			41,250
Cost of sales	...		2,51,250
Profit (*balancing figure*)	...		23,750
Sales	...		2,75,000

Problem 12.

A factory produces and sells 1,000 units of a product in July, 1985, for which the following particulars are available :

Stock of direct materials on 1.7.85	... Rs. 6,000
Purchase and receipt of direct materials in July, 1985	Rs. 1,44,000
Direct wages paid in cash in July, 1985 (which includes Rs. 3,000 on account of June, 1985 and an advance of Rs. 2,000)	Rs. 55,000
Works overhead charges for the month	Rs. 60,000
Stock of direct materials on 31.7.85	Rs. 10,000
Administration and selling overheads	Rs. 25 per unit
Sales price	Rs. 300 per unit

From the above particulars you are required to (*a*) prepare a cost statement for July, 1985, (*b*) estimate the sale price of a unit of the same product in August, 1985, assuming—

   (*i*)   20% increase in direct materials cost,

   (*ii*) 10% increase in direct wages,

   (*iii*) 5% increase in works overhead charges,

   (*iv*) 20% reduction in administration and selling overhead charges, and

   (*v*)   Same percentage of profit on sales price as in July, '85.

(C. U., B. Com. Hons.)

Solution :

Statement of Cost

Output : 1,000 units   *Period : July, 1985*

		Total Amount		Cost per unit
		Rs.	Rs.	Rs.
Materials consumed :				
Stock as on 1-7-85	...	6,000		
Purchases during the month	...	1,44,000		
		1,50,000		
Less : Stock as on 31-7-85	...	(10,000)		
			1,40,000	140
Direct wages—paid in July	...	55,000		
Less : Payment for June	...	(3,000)		
		52.000		
Less : Advance payment	...	(2.000)	50 000	50
Prime cost	.		1,90,000	190
Works overhead	...		60,000	60
Works cost or Cost of production	...		2,50,000	250
Administration and selling overheads				
@ Rs. 25 per unit	...		25,000	25
Cost of sales	.		2,75,000	275
Profit (*balancing figure*)	...		25,000	25
Selling price @ Rs. Rs. 300/-	...		3,00,000	300

Estimate of Selling price per unit *in August, 1985*

	Rs.
Direct Materials $\frac{120}{100} \times 140$	168·00
Direct Wages $\frac{110}{100} \times 50$	55·00
Prime cost	223·00
Works overhead $\frac{105}{100} \times 60$	63·00
Works cost or Cost of production	286·00
Administration and selling overheads $\frac{80}{100} \times 25$	20·00
Cost of sales	306·00
Profit @ $8\frac{1}{3}\%$ on sale or $\frac{1}{12}$th of sales i.e., $\frac{1}{11}$th of cost'	27·82
Selling price	333·82

Working Note : 'Ratio of profit to sales in July, '85 $= \dfrac{25,000}{3,00,000} = \frac{1}{12}$th or $8\frac{1}{3}\%$.

Problem 13

The following particulars are available for the previous years' production of fans for M/s. Eastern Engineering Co. :

(*i*) Total production—1,000 units.

(*ii*) Total cost of raw materials consumed—Rs. 12,000.

(*iii*) Total cost of direct labour—Rs. 20,000.

(*iv*) Total works overhead expenses—Rs. 40,000.

  (*v*)   Total general overhead expenses—Rs. 36,000.

  (*vi*)   Total selling & distribution overhead expenses—Rs. 16,000.

  (*vii*)   Total sale price for 800 units sold—Rs. 1,12,640.

On the basis of the undernoted instructions prepare a detailed price quotation per unit of fan for the current year :

(*a*)   Cost of raw materials and direct labour are to increase by 10% and 15% respectively over the previous year's level.

(*b*)   Works overhead, general overhead, as well as selling and distribution overhead are to be charged at the same respective percentages as in the previous year.

(*c*)   Profit is to be estimated at the same percentage on Total Cost as is earned in the previous year.   *(C. U., B. Com. Hons.)*

Solution :

Cost Sheet *for the year....*

(*Output : 1,000 units*)

	Total	Per unit
	Rs.	Rs.
Raw materials consumed ...	12,000	12·00
Direct labour ...	20,000	20·00
Prime cost ...	32,000	32·00
Works overhead expenses ...	40,000	40·00
Works cost ...	72,000	72·00
General overhead expenses ..	36,000	36·00
Cost of production ...	1,08,000	108·00
Less : Closing stock (200 units) @ Rs. 108 ...	(21,600)	—
Cost of goods sold (800 units) ...	86,400	108·00
Selling and distribution overhead expenses (on 800 units) ...	16,000	20·00
Cost of sales ...	1,02,400	128·00
Profit (*balancing figure*) ...	10,240	12·80
Sales ...	1,12,640	140·80

Estimated price to be quoted per unit *for the year*

	Rs.
Raw materials $\frac{110}{100} \times$ Rs. 12 ...	13·20
Direct labour $\frac{115}{100} \times 20$ ...	23·00
Prime cost ...	36·20
Works overhead @ 200% of direct labour[1] ...	46·00
Works cost ...	82·20
General overhead @ 50% of works cost[2] ...	41·10
Cost of production ...	123·30
Selling and distribution overhead @ 18·5% of cost of goods sold[3] ...	22·80
Total cost ...	146·10
Profit @ 10% on total cost[4] ...	14·61
Price to be quoted ...	160·71

Working Notes :

(1) Percentage of works overhead on direct labour $= \dfrac{40,000}{20,000} \times 100 = 200\%$

(2) Percentage of general overhead on works cost $= \dfrac{36,000}{72,000} \times 100 = 50\%$

(3) Percentage of selling and distribution expenses on cost of goods sold

$$= \dfrac{16,000}{86,400} \times 100 = 18 \cdot 5\%$$

(4) Percentage of profit on cost $= \dfrac{10,240}{1,02,400} \times 100 = 10\%$

Problem 14.

Bharat Electronics Ltd. furnishes the following information for 10,000 TV valves manufactured during the year, 1985 :

	Rs.
Materials	90,000
Direct wages	60,000
Power and consumable stores	12,000
Factory indirect wages	15,000
Lighting of factory	5,500
Defective work (cost of rectification)	3,000
Clerical salaries and management expenses	33,500
Selling expenses	5,500
Sale proceeds of scraps	2,000
Plant repairs & maintenance and depreciation	11,500

The net selling price was Rs. 31·60 per unit sold and all the units were sold.

As from 1st January, 1986, the selling price was reduced to Rs. 31·00 per unit. It was estimated that production could be increased in 1986 by 50% utilizing spare capacity. Rates for materials and direct wages will increase by 10%.

You are required to prepare—

(a) Cost sheet for the year, 1985, showing various elements of cost per unit, and

(b) Estimated cost and profit for 1986 assuming that 15,000 units will be produced and sold during the year and factory overheads will be recovered as a percentage of direct wages and office and selling expenses as a percentage of works cost.   (*C. A. Inter.—Adapted*)

Solution :

Cost Sheet

Output : 10,000 units   *Period : year ended 31st Dec. '85*

		Total		Per unit	
		Rs.	s.	Rs.	Rs.
Materials	...		90,000		9·00
Wages	...		60.000		6·00
Prime cost	...		1,50,000		15·00
Factory overheads :					
Power and consumable stores	...	12,000		1·20	
Factory indirect wages	...	15,000		1·50	
Lighting of factory	...	5,500		0·55	
Defective work (cost of rectification)	...	3,000		0·30	
Plant repairs & maintenance and dep.	...	11,500		1·15	
		47,000		4·70	
Less : Sale of scraps	...	(2,000)		0·20	
			45,000		4·50
Works cost	...		1,95,000		19·50
Office and selling expenses :					
Clerical salaries and management expenses	...	33,500		3·35	
Selling expenses	...	5,500		0·55	
			39,000		3·90
Cost of sales	...		2,34,000		23·40
Profit (*balancing figure*)	...		82.000		8·20
Sales	...		3,16,000		31·60

Note : The cost of rectification of defective work has been included in factory overheads on the assumption that the defectives are normal. Where, however, the defective work is due to abnormal causes, the cost of rectification should be charged to the Costing Profit & Loss A/c.

Estimated Cost Sheet for 1986

Estimated output 15,000 units

		Total	Per unit
		Rs.	Rs.
Materials : 15,000 × Rs. 9·90	...	1,48.500	9·90
Wages : 15,000 × Rs. 6·60	...	99,000	6·60
Prime cost	...	2,47,500	16·50
Factory overheads @ 75% of wages[1]	...	74,250	4·95
Works cost	...	3,21,750	21·45
Office & selling expenses @ 20% of works cost[2]	...	64,350	4·29
Cost of sales	...	3,86,100	25·74
Estimated Profit (*balancing figure*)	...	78,900	5·26
Sales (15,000 × Rs. 31)	...	4,65,000	31·00

Working Notes :

(1) Percentage of factory overhead on wages in 1985—

$$\frac{45,000}{60,000} \times 100 = 75\%$$

(2) Percentage of office and selling expenses on works cost in 1985—

$$\frac{39,000}{1,95,000} \times 100 = 20\%$$

Problem 15.

A factory uses job costing method. The following cost data is obtained from its books for the year ended 31st December, 1985 :

	Rs.
Direct materials	1,80,000
Direct wages	1,50,000
Profit	1,21,800
Selling and distribution overheads	1,05,000
Administration overheads	84,000
Factory overheads	90,000

(a) Prepare a job cost sheet indicating the prime cost, works cost, production cost, cost of sale and the sales value.

(b) In 1986 the factory receives an order for a number of jobs. It is estimated that direct materials required will be Rs. 2,40,000 and direct labour will cost Rs. 1,50,000. What should be the price for these jobs if the factory intends to earn the same rate of profit on sales assuming that the selling and distribution overheads have gone up by 15%? The factory recovers factory overheads as a percentage of direct wages and administration, selling and distribution overheads as a percentage of works cost, based on cost rates prevailing in the previous year.

Solution

Job Cost Sheet *for the year ended 31st Dec. '85*

		Rs.
Direct materials	...	1,80,000
Direct wages	...	1,50,000
Prime cost	...	3,30,000
Factory overheads	...	90,000
Works cost	...	4,20,000
Administration overheads	...	84,000
Cost of production	...	5,04,000
Selling and distribution overheads	...	1,05,000
Cost of sales	...	6,09,000
Profit	...	1,21,800
Sales Value	...	7,30,800

Estimated Cost Sheet and price of jobs for 1986

		Rs.
Direct materials	...	2,40,000
Direct wages	...	1,50,000
Prime cost	...	3,90,000
Factory overheads 60% of direct wages[1]	...	90,000
Works cost	...	4,80,000
Administration overheads : 20% of works cost[2]	...	96,000
Cost of production	...	5,76,000
Selling and distribution overheads : 28·75% of works cost[3]	...	1,38,000
Cost of sales	...	7,14,000
Profit : 16⅔% on sales i.e., 20% on cost[4]	...	1,42,800
Selling price	...	8,56,800

Working Notes :

(1) Percentage of factory overheads on direct wages $= \dfrac{90,000}{1,50,000} \times 100 = 60\%$

(2) Percentage of administration overheads on works cost $= \dfrac{84,000}{4,20,000} \times 100 = 20\%$

(3) Percentage of selling and distribution overheads on works cost—

	Rs.
Selling and distribution overheads	1,05,000
Add : 15% increase	15,750
	1,20,750

Percentage on works cost $= \dfrac{1,20,750}{4,20,000} \times 100 = 28 \cdot 75\%$

(Alternatively, percentage in 1985 is $\dfrac{1,05,000}{4,20,000} \times 100 = 25\%$.

So, percentage in 1986 $= 25\% + 15\%$ of $25\% = 28 \cdot 75\%$)

(4) Percentage of profit—

on sales $\dfrac{1,21,800}{7,30,800} \times 100 = 16\frac{2}{3}\%$

on cost $\dfrac{1,21,800}{6,09,000} \times 100 = 20\%$

Problem 16.

The following figures are available from the books of Best Manufacturing Co. for the year ended 31.12.81 :

Materials :	Rs.
Stock on 1.1.81	1,000
Stock on 31.12.81.	2,000
Purchases during 1981	10,000
Wages	7,500
Profit for the year	6,090
Selling overhead	5,250
Factory overhead	4,500
Administration overhead	4,200

(a) Prepare a cost sheet showing prime cost, works cost, cost of production, cost of sales and sales.

(b) In 1982 the factory receives an order for a job which will require materials Rs. 1,200 and wages Rs. 750. Ascertain the sale price of the job if the factory intends to earn a profit 10% higher than the percentage of profit earned in 1981. Assume that the factory overhead has gone up by 16⅔% and selling overhead has gone down by 20% in 1982. Further assume that factory overhead is recovered as a % of the wages and administration and selling overhead as a % of works cost.

(C. U., B. Com. Hons.—Adapted)

Solution :

Cost Sheet *for the year ended 31st December, 1981*

		Rs.	Rs.
Materials consumed :			
Stock on 1-1-81	...	1,000	
Purchases during 1981	...	10,000	
		11,000	
Less : Stock on 31-12-81	...	(2,000)	
			9,000
Wages	...		7,500
Prime cost	...		16,500
Factory overhead	...		4,500
Works cost	...		21,000
Administration overhead	...		4,200
Cost of production	...		25,200
Selling overhead	...		5,250
Cost of sales	...		30,450
Profit for the year	...		6,090
Sales	...		36,540

Estimated Cost Sheet and Price of Job No...in 1982

		Rs.
Materials	...	1,200
Wages	...	750
Prime cost	...	1,950
Factory overhead : 70% of wages[1]	...	525
Works cost	...	2,475
Administration overhead : 19·31% of works cost[2]	...	478
Cost of production	...	2,953
Selling overhead : 19·31% of works cost[3]	...	478
Cost of sales	...	3,431
Profit : 26⅔% of sale i.e., $\frac{4}{11}$th of cost[4]	...	1,248
Sale price	...	4,679

Working Notes :

      Cost Sheet for the year 1981 at 1982 rates

	Rs.
Materials	9,000
Wages	7,500
Prime cost	16,500
Factory overhead : 4,500+16⅔% thereof	5,250
Works cost	21,750
Administration overhead	4,200
Cost of production	25,950
Selling overhead : 5,250−20% thereof	4,200
Cost of sales	30,150

(1) Percentage of factory overhead on wages in 1982 $= \frac{5,250}{7,500} \times 100 = 70\%$

(2) Percentage of administration overhead on works cost in 1982

$$= \frac{4,200}{21,750} \times 100 = 19 \cdot 31\%$$

(3) Percentage of selling overhead on works cost in 1982 $= \frac{4,200}{21,750} \times 100 = 19 \cdot 31\%$

(4) Percentage of profit on sale in $1981 = \frac{6,090}{36,540} \times 100 = 16\frac{2}{3}\%$

$\therefore$ Percentage of profit on sale in $1982 = 16\frac{2}{3}\% + 10\% = 26\frac{2}{3}\%$

When sales value is Rs. 100, profit is Rs. $26\frac{2}{3}$

$\therefore$ Cost is Rs. $73\frac{1}{3}$. So, $\frac{Profit}{Cost} = \frac{26\frac{2}{3}}{73\frac{1}{3}}$ or, $\frac{4}{11}$.

(Normally profit is expressed as a percentage of sales. The result will be different if the percentage is taken on cost.)

Problem 17.

The following particulars relating to the year 1982, have been taken from the books of a chemical works, manufacturing and selling a chemical mixture :

Stock on 1st January, 1982 :	Kg.	Rs.
Raw materials	2,000	2,000
Finished mixture	500	1,750
Factory stores		7,250
Purchases		
Raw materials	1,60,000	1,80,000
Factory stores		24,250
Sales :		
Finished mixture	1,53,050	9,18,000
Factory scrap		8,170
Factory wages		1,78,650
Power		30,400
Depreciation of machinery		18,000
Salaries :		
Factory		72,220
Office		37,220
Selling		41,500
Expenses :		
Direct		18,500
Office		18,200
Selling		18,000
Stock on 31st December, 1982		
Raw materials	1,200	?
Finished mixture	450	?
Factory stores		5,550

The stock of finished mixture at the end of 1982 is to be valued at the factory cost of the mixture for that year. The purchase price of raw materials remained unchanged throughout 1982.

Prepare a statement giving the maximum possible information about cost and its break-up for the year, 1982,   (*Delhi B. Com. Hons.*)

Solution :

<div align="center">

Statement of Cost

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<div align="right">

Period : year ended Dec. 31, 1982

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		Rs.	Rs.
Materials consumed :			
Opening stock	...	2,000	
Purchases	...	1,80,000	
		1,82,000	
Less : Closing stock $\left(\frac{1,200}{1,60,000} \times \text{Rs. } 1,80,000\right)$	...	(1,350)	
			1,80,650
Factory wages	...		1,78,650
Direct expenses	...		18,500
Prime cost	...		3,77,800
Factory Overheads :			
Power	...	30,400	
Depreciation of machinery	...	18,000	
Salary (factory)	...	72,220	
Factory stores :			
Opening stock	7,250		
Purchases	24,250		
	31,500		
Less : Closing stock	(5,550)	25,950	
		1,46,570	
Less : Sale of factory scrap	...	(8.170)	
			1,38,400
Cost of goods manufactured	...		5,16,200
Add : Opening stock of finished mixture	...		1,750
			5,17,950
Less : Closing stock of finished mixture[1]	...		(1,518)
Cost of goods sold	...		5,16,432
Office and administration overhead :			
Salary (office)	—	37,220	
Office expenses	...	18,200	
			55,420
Selling and distribution overhead :			
Salary (selling)	...	41,500	
Selling expenses	...	18,000	
			59,500
Cost of sales	...		6,31,352
Profit (*balancing figure*)	...		2,86,648
Sales	...		9,18,000

Note : [1]Closing stock of finished mixture valued at factory cost (as stated in the problem) : $\frac{450}{1,53,050+450-500} \times$ Rs. 5,16,200 = Rs. 1,518.

Problem 18.

From the Cost Ledger of B.K. Industries the following information was obtained for the year, 1981 :

	Rs.
Rates and taxes for factory premises	2,800
Lighting of the factory	5,200
Depreciation (plant)	7,000
Staff salaries	24,000
Management salaries	12,000
Power	9,000
Indirect wages	24,500

	Rs.
Repairs and maintenance (plant)	20,000
Cost of rectification of defective work	5,600
Consumable stores	15,000
Selling expenses	14,660
General expenses	9,200
Receipt from the sale of scrap	2,400
Profit from guest house	1,000

Production was 1,00,000 units and the prime cost per unit was—materials—Rs. 1·80 and wages—Rs. 1·20. The net selling price was Rs. 4·70 per unit. All the units were sold.

As from 1st January, 1982, the selling price was reduced to Rs. 4·50 per unit. It was estimated that production could be increased in 1982 by 50 per cent without incurring any overtime or extra shift working.

Prepare statements showing (1) Different elements of cost for 1981, (2) Estimated cost and profit for 1982, assuming that 1,50,000 units will be produced and sold in the year. Assumptions made to solve the problem should be stated.

Solution :

Statement of Cost

Output : 1,00,000 units   *Period : year ended 31st Dec. '81*

		Total Amount		Cost per unit	
		Rs.	Rs.	Rs.	Rs.
Materials	...		1,80,000		1·800
Wages	...		1,20,000		1·200
Prime cost	...		3,00,000		3·000
Works overhead :					
Variable : Power	...	9,000		0·090	
Consumable Stores	...	15,000		0·150	
Cost of rectification of defective work	...	5,600		0·056	
		29,600		0·296	
Less : Sale of scrap	...	2,400		0·024	
			27,200		0·272
Fixed : Indirect wages	...	24,500		0·245	
Depreciation (plant)	...	7,000		0·070	
Rates and taxes for factory premises	...	2,800		0·028	
Lighting of the factory	...	5,200		0·052	
Repairs and maintenance (plant)	...	20,000		0·200	
			59,500		0·595
Works cost	...		3,86,700		3·867
Administration overhead :					
Fixed : Management salaries	...	12,000		0·120	
Staff salaries	...	24,000		0·240	
General expenses	...	9,200		0·092	
			45,200		0·452
Cost of production	...		4,31,900		4·319
Selling overhead : fixed	...		14,660		0·147
Cost of sales	...		4,46,560		4·466
Profit (*balancing figure*)	...		23,440		0·234
Sales	...		4,70,000		4·700

Notes : (i) Profit from guest house has been excluded from cost, because it is not an item for cost accounts. It is an income to be shown in financial accountancy.

(ii) It has been assumed that the defectives are within normal limit.

Statement of Estimated Cost and Profit for 1982
(*Estimated output 1,50,000 units*)

		Total	Per unit
		Rs.	Rs.
Materials @ Rs. 1·80 per unit	...	2,70,000	1·800
Wages @ Rs. 1·20 per unit	...	1,80,000	1·200
Prime cost	...	4,50,000	3·000
Works overhead : variable @ Rs. 0·272 per unit	...	40,800	0·272
fixed	...	59,500	0·397
Works cost	...	5,50,300	3·669
Administration overhead : fixed	...	45,200	0·301
Cost of production	...	5,95,500	3·970
Selling overhead : fixed	...	14,660	0·098
		6,10,160	4·068
Profit	...	64,840	0·432
Sales (1,50,000 × 4·50)	...	6,75,000	4·500

Note : It has been assumed that selling and other expenses of fixed nature will not change as a result of increase in output.

Problem 19.

A critical study of past expenses incurred on the manufacture of two kinds of acid containers (drums) shows :

Nature of Expense	*Expenses incurred on the manufacture of acid containers*	
	Type "X"	*Type "Y"*
	Rs.	Rs.
Direct materials	3·50	6·50
Direct wages	1·00	1·50
Plant and machine usage allocated on hourly basis	2·00	3·00
General overhead apportioned at 200% of direct wages	2·00	3·00
Cost per container	8·50	14·00

Cost records for the month of August, 1983 show :

	Rs.
Direct materials utilised	26,500
Direct wages	5,850
Plant and machine usage	16,250
General overheads	11,700
Total	60,300

Containers produced : Type 'X' 2,000 units and Type 'Y' 3,000 units.

Prepare a consolidated cost sheet distributing the total production cost between the two types of containers according to the different elements of cost and also showing cost per container of each type.

Solution :

Computation of the cost of production of the given quantities of the two types of containers on the basis of past expenses (for July) per container.

		Type X (2,000 units)	Type Y (3,000 units)	Total
		Rs.	Rs.	Rs.
Direct materials	...	7,000	19,500	26,500
Direct wages	...	2,000	4,500	6,500
Plant and machine usage	...	4,000	9,000	13,000
General overhead	...	4,000	9,000	13,000
		17,000	42,000	59,000

Except direct materials, other expenses as computed above, are quite different from the actual expenses incurred in August, 1983. The actual expenses should, therefore, be distributed between the two types of containers on the basis of past expenses for given quantities.

Cost Sheet *for the month of August, 1983*

		Type X (2,000 units)	Type Y (3,000 units)
		Rs.	Rs.
Direct materials $(2,000 \times 3.5)$ and $(3,000 \times 6.5)$	...	7,000	19,500
Direct wages : $\frac{2,000}{6,500} \times$ Rs. 5,850	...	1,800	—
$\frac{4,500}{6,500} \times$ Rs. 5,850	...	—	4,050
Prime cost	...	8,800	23,550
Plant and machinery usage : $\frac{4,000}{13,000} \times$ Rs. 16,250	...	5,000	—
$\frac{9,000}{13,000} \times$ Rs. 16,250	...	—	11,250
Works cost	...	13,800	34,800
General overhead : $\frac{4,000}{13,000} \times$ Rs. 11,700	...	3,600	—
$\frac{9,000}{13,000} \times$ Rs. 11,700	...	—	8,100
Total cost	...	17,400	42,900
Cost per container	...	8·70	14·30

EXERCISES

Theoretical :

1. Tabulate the "Elements of Cost" showing the usual items of expenditure under each.

2. Illustrate by means of a chart the components which make up the selling price of a product.

3. Explain the terms (i) direct expenditure and (ii) indirect expenditure and state the elements of cost comprised in each.   (*C. U., B. Com.—Hons.*)

4. Explain the following and give examples :
     (a) Direct material and Indirect material ;
     (b) Direct wages and Indirect wages.

5. (a) Explain briefly the difference between a direct cost and an indirect cost, giving an example of each type.

(b) For each of the following items, state whether they are direct or indirect costs :

(i) Sheet steel for a motor car manufacturer.

(ii) Machine operators' wages for a golf-ball manufacturer.

(iii) Supervisors' wages for a golf-ball manufacturer.

(iv) Chargeable time in an accountancy practice.

(v) Factory rates for an oven manufacturer.

(vi) Production royalties for a mining company.

(vii) Electricity for a brewery.

(viii) Hire of plant for a building contractor in a long-term contract.

(ix) The audit fee of an oil company.

(x) Glue for a furniture maker.

6. What do you mean by chargeable expenses ? Give three examples.

7. You are required to state why it is important to distinguish between "fixed" and "variable" expenses in Cost Accounting, and give two examples of each type of expenses.   (*C. U., B. Com. Hons.*)

8. Define fixed expenses, variable expenses and semi-variable expenses, giving three examples of each.

9. Explain fixed, variable and semi-variable overhead. Give one example of each overhead to illustrate your answer.   (*C. U., B Com. Hons.*)

10. (a) Define : (i) prime cost ; (ii) factory overhead.

(b) Give three examples of each of the following :

(i) Fixed factory overhead ;

(ii) Variable factory overhead ;

(iii) Partly-variable factory overhead.

11. Explain the distinction between direct and indirect expenditure giving suitable illustrations. When the 'Works Cost' has been determined, what are the further elements to be added thereto to determine the 'Cost of Sales' ?   (*C. U., B. Com. Hons.*)

12. Distinguish clearly between direct and indirect materials. Under what circumstances may direct materials be charged indirectly to the finished product.
(*C. U., B. Com. Hons.*)

13. Distinguish between :

(a) Cost of sales and cost of goods sold.

(b) Direct expenditure and Indirect expenditure.

(c) Fixed cost and Variable cost.   (*C. U., B. Com. Hons. '82*)

14. Suggest six different bases under which cost may be classified, and for each basis, suggest the different classifications of costs contained therein.

15. What do you mean by overhead expenditure ? Give the functional classification of overhead expenditure with two examples of each class.   (*C. U., B. Com. Hons. '82*)

16. What are the differences between 'Selling' and 'Distributing' expenses ? Give five examples of each category.

17. Distinguish between Direct labour and Indirect labour.

18. List any ten items of factory overhead.

19. Distinguish between chargeable expenses and overhead expenses.

Practical :

1. A manufacturing company has debited Rs. 39,740 in its books as 'Establishment expenses'. On enquiry the following details were obtained :

	Rs.		Rs.
Rent, rates and insurance of office	840	Lighting of office	240
Rent, rates and insurance of warehouse	2,350	Lighting of warehouse	380
Office salaries	5,320	Printing and stationery	3,400
Directors' remuneration	4,000	Trade magazines	230
Selling Agent's commission	10,300	Bank charges	160
Travelling expenses	1,860	Discount allowed	3,560
Warehouse wages	4,200	Donations	600
Warehouse repairs	830	Bad Debts	470
		Debenture discount	1,000

From the above information prepare a statement showing in separate totals : (i) Selling expenses, (ii) Distribution expenses, (iii) Administration expenses, and (iv) Expenses to be excluded from costs.

2. The following data have been extracted from the books of M/s. Tribeni Industries Ltd., for the calendar year, 1982 :

	Rs.
Opening stock of raw material	25,000
Purchase of raw material	85,000
Closing stock of raw material	40,000
Carriage Inward	5,000
Wages—Direct	75,000
—Indirect	10,000
Other Direct Charges	15,000
Rent and rates—Factory	5,000
—Office	500
Indirect consumption of material	500
Depreciation—Plant etc.	1,500
—Office furniture	100
Salary—Office	2,500
—Salesmen	2,000
Other factory expenses	5,700
Other office expenses	1,100
Managing Director's remuneration	12,000
Other selling expenses	1,000
Travelling expenses of Salesmen	1,100
Carriage and Freight Outward	1,000
Sales	2,50,000
Advance Income-Tax paid	15,000
Advertisement	2,000

Managing Director's remuneration is to be allocated as—Rs. 4,000 to factory, Rs. 2,000 to the office and Rs. 6,000 to selling department.

From the above information prepare a statement showing (a) Prime cost, (b) Works cost, (c) Cost of production, (d) Cost of sales, (e) Profit.

3. From the undernoted particulars determine the (i) works cost, (ii) total cost and (iii) sale price per unit :

	Rs.
Total number of units produced · 2,000	-
Raw materials cousumed	1,40,000
Wages	60,000
Power and fuel	15,000
Carriage inward	4,000
Packing expenses	4,000
Salary paid to production staff	25,000
Depreciation on plant and machinery	3,000
Office expenses	10,000

Profit on sale will be 15% of the sale price.

(C. U., B. Com. Hons.)

4. From the following particulars prepare a cost sheet for the month of January, 1986 :

	Rs.
Stock of raw materials on 1-1-86	3,000
Purchase of raw materials	28,000
Stock of raw materials on 31-1-86	4,500
Productive wages	6,300
Depreciation	2,000
Factory rent	1,800
Materials destroyed on fire	200
Office rent	4,800
General expenses	600
Selling overhead	1,500

Number of units produced during the month 4,000
Stock of finished goods on 1-1-86—2,000 units valued at   3,000
Stock of finished goods on 31-1-86 -500 units
Apply FIFO method

(C. U., B. Com. Pass '86)

5. From the following particulars prepare a cost sheet showing the profit or loss for the year ended 31st December, 1984 :

	January 1, 1984 Rs.	*December 31, 1984* Rs.
Stock of raw material	12,550	10,910
Work-in-progress	6,600	7,200
Finished stock	13,660	14,500

Other data for the year are :

	Rs.		Rs.
Purchase of raw material	2,25,500	Factory overhead	87,600
Productive wages	1,12,000	Chargeable expenses	15,200
Selling overhead	40,000	Office and administrative	
Sales	5,92,250	overhead	34,500

(C. U., B. Com. Pass '85)

6. From the following particulars prepare a cost sheet showing cost of sales and profit :

	Rs.
Opening Stock :	
Raw materials	25,000
Finished goods	17,000
Work-in-progress	8,000
Closing Stock :	
Raw materials	26,000
Finished goods	16,000
Work-in-progress	9,000
Purchase of raw materials	30,000
Direct wages	17,000
Works expenses	8,800
Office expenses	3,000
Selling & distribution expenses	4,000
Sales of finished goods	77.000
Depreciation of Plant & Machinery	8,000
Sales of Scrap	3,000

(C. U., B. Com. Pass '83)

7. From the following particulars prepare a cost sheet for the month of January, 1982 :

	Rs.
Stock on 1-1-82	
Raw materials	1,200
Work-in-progress	3,100
Finished goods	6,700
Stock on 31-1-82 :	
Raw materials	1,500
Work-in-progress	4,000
Finished goods	3,800
Raw materials purchased	20,800
Carriage on purchase	600
Sale of finished goods	60,000
Direct wages	15,300
Non-productive wages	300
Chargeable expenses	700
Factory overhead	$33\frac{1}{3}$% of wages
Office overhead	2,700
Selling overhead	2,800

(C. U., B. Com. Pass '82)

8. From the following particulars relating to production and sales for the year ended 31st December, 1985, prepare a statement of cost showing, *inter alia*, the Prime cost, Factory cost, Cost of Production, Cost of Goods sold and total as well as per unit cost of sales and profit.

	as on 1.1.85 Rs.	as on 31.12.85 Rs.
Raw materials	16,000	19,600
Work-in-progress	12,600	4,600
Finished goods (*at cost*)	16,400 (*3,000 units*)	? (*2,500 units*)

Other information for the year :   Rs.
    Purchase of Raw Materials   1,11,600
    Sales of finished goods (40,500 units)   2,83,500
    Productive wages   67,200
    Office and Administrative Expenses   20,800
    Selling and Distribution Expenses   50 paise per unit sold
    Machine Hours Worked   8,000 hours
    Machine hour rate   Rs. 2·50

Assume that sales are made on the basis of 'first in, first out' principle.

(*C. U., B. Com. Hons.* '86)

9. From the following particulars relating to the production and sales for the year ended 30th June, 1987, prepare a cost statement showing therein (*i*) Prime Cost, (*ii*) Works Cost, (*iii*) Cost of Production, (*iv*) Cost of Sales and (*v*) Profit per Unit :

		Rs.
Raw Materials as on 1.7.86		12,500
Work-in-progress as on 1.7.86 :		
At prime Cost	15,000	
Add : Manufacturing expenses	3,000	18,000
Finished goods at cost as on 1.7.86 (8,000 units)		60,000
Raw Materials purchased		1,10,000
Freight on Raw Materials purchased		5,000
Loss of Materials by fire		5,000
Factory expenses		70,000
Chargeable expenses		25,000
Direct Labour		1,35,000
Administrative expense Rs. 2 per unit		
Selling expense Re. 1 per unit		
Distribution expense		15,000
Sale of finished goods (28,000 units)		4,00,000
Raw Materials as on 30.6.87		20,000
Work-in-progress as on 30.6.87 :		
At Prime Cost	10,000	
Add : Manufacturing expenses	8,000	18,000
Stock of finished goods on 30.6.87 (10,000 units)		?

Assume sales are made on FIFO basis.

(*C. U., B. Com. Hons.* '88)

10. From the following particulars (a) Prepare a cost sheet showing the (i) Cost of materials consumed, (ii) Prime cost, (iii) Production cost, (iv) Total cost, (v) Profit, and (b) Calculate (i) Percentage of production overhead on direct wages, (ii) Percentage of general overhead on production cost and (iii) Percentage of profit on sales :

	Rs.
Stock of raw materials, 1st Jan. 1982	30,850
Work-in-progress (,,)	60,850
Purchase of raw materials	1,43,250
Direct Wages	1,78,500
Production overhead expenses	1,42,800

	Rs.
General overhead expenses	1,12,700
Stock of raw materials, 31st. Dec., 1982	37,700
Work-in-progress (..)	67,750
Sale for the year	8,60,625

There is no opening or closing stock of finished goods.

11. The following information has been obtained from the records of a manufacturing concern for the period from June 1 to June 30, 1985 :

	Rs.
Cost of raw materials on June 1, 1985	30,000
Purchase of raw materials during the month	4,50,000
Wages paid	2,30,000
Factory overhead	92,000
Cost of work-in-progress on June 1, 1985	12,000
Cost of raw materials on June 30, 1985	25,000
Cost of work-in-progress on June 30, 1985	15,000
Cost of stock of finished goods on June 1, 1985	60,000
Cost of stock of finished goods on June 30, 1985	55,000
Selling and distribution overheads	20,000
Sales	9,00,000
Administration overhead	30,000

Prepare : (i) Statement of cost of production of goods manufactured ; and

(ii) Statement of cost of production of finished goods sold.

12. From the following particulars relating to production and sales for the year ended 31st December, 1981 prepare Statements of Production Cost and of Cost of Goods sold showing *inter alia* the Prime Cost and the cost per unit. Also prepare the Costing Profit & Loss Account.

	Rs.
Raw materials as on 1-1-81	25,000
Work-in-progress as on 1-1-81	36,000
Finished goods as on 1-1-81 (8,000 units)	1,44,000 *(at cost)*
Raw materials purchased	2,00,000
Factory Wages	2,70,000
Factory Expenses	1,44,000
Administration Expenses	90,000
Selling Expenses	54,000
Distribution Expenses	36,000
Sale proceeds of finished goods (30,000 units)	9,00,000
Raw materials as on 31-12-81	45,000
Work-in-progress as on 31-12-81	54,000
Finished goods as on 31-12-81 (10,000 units)	at cost

(C. U., B. Com. Hons.)

13. The following extract of costing information relates to a commodity for the year ended 31st March, 1984 :

	Rs.
Stock on 1st April, 1983 :	
Raw materials	5,000
Finished Product (1,000 Tonnes)	4,000

	Rs.
Stock on 31st March, 1984 :	
Raw materials	5,560
Finished Product (2,000 Tonnes)	8,000
Raw materials purchased	30,000
Direct Wages	25,000
Rent, Rates and Insurance of works	10,000
Carriage Inwards	360
Work-in-progress on 1st April, 1983	1,200
Work-in-progress on 31st March, 1984	4,000
Cost of Factory Supervision	2,000
Sales of finished product	75,000

Advertisement and selling expenses amount to 25 paise per tonne sold. 16,000 tonnes were produced during the year.

Prepare a statement showing (a) the value of raw materials used ; (b) the cost of the output for the year ; (c) the cost of the turnover for the year ; (d) the net profit for the year and (e) the net profit per tonne of the commodity. (C. U., B. Com. Hons. '84)

14. The following figures relate to the costing of a manufacturer of electric fans (of uniform size and quality) for a period of 3 months :

	Rs.
Completed stock on 1-10-90	nil
Completed stock on 31-12-90	20,250
Stock of raw materials on 1-10-90	5,000
Stock of raw materials on 31-12-90	3,500
Factory Wages	75,000
Indirect wages	12,500
Materials Purchased	32,500
Sales	1,12,500

The number of fans manufactured during the three months was 3,000.

Prepare a statement showing the cost per fan and the price to be quoted for 750 fans to realise the same percentage of profit as realised during the three months referred to above, assuming identical costs.

(C. U., B. Com. Hons.)

15. Mr. Mohanta furnishes the following data relating to the manufacture of a standard product during the month of April, 1983 :

	Rs.
Raw materials consumed	15,000
Direct labour charges	9,000
Machine hours worked	900
Machine hour rate	5
Administrative overheads	20% on works cost
Selling overheads	0·50 per unit
Units produced	17,100
Units sold	16,000 units at Rs. 4 per unit

You are required to prepare a cost sheet from the above, showing—

(a) the cost per unit,

(b) profit per unit sold and total profit for the period.

16. The following details are available for working of a firm for a period :

	Opening Rs.	Closing Rs.
Materials	40,000	60.000
Work-in progress	3,000	5,000

Materials were purchased for Rs. 80,000. Rs. 50,000 wages were paid. Factory overheads are charged at 60% of wages. Administration overheads are recovered at 25% of works cost of goods finished. Selling overheads are charged at 20% of cost of goods sold.

2,000 units have been manufactured out of which 1,800 units have been sold at 20% profit on selling price. There was no opening stock of finished goods.

Prepare a statement showing the Prime Cost, Works Cost, Cost of Sales and Profit—in total and per unit for the period.

17. A factory produces a standard product. The following information is given to you from which you are required to prepare cost sheet for the period ended on 31-7-1983 :

	Rs.
Consumable materials :	
Opening stock	10,000
Purchases	85,000
Closing stock	4,000
Direct Wages	20,000
Other direct expenses	10,000
Factory overheads	100 of direct labour
Office overheads	10% of works cost
Selling and distribution expenses	Rs. 2 per unit sold
Units of finished product :	
In hand at the beginning of the period 1,000 (valued at Rs. 16,000)	
Produced during the period 10,000	
In hand at the end of the period 2,000	

Also find out the selling price per unit on the basis that profit mark-up is uniformly made to yield a profit of 20% of the selling price. There was no work-in-progress either at the beginning or at the end of the period.

18. The following information is given by a factory for the year, 1982 :

	Rs.
Direct Materials used	2,00,000
Direct Wages	1,50,000
Factory Expenses	90,000
Office and Administration Expenses	88,000

On the basis of the above particulars ascertain the cost of a job where materials required will be Rs. 1,000 and wages amounting to Rs. 2,000 will be spent. What will be the quotation if a profit of 20% on selling price is desired ?

19. From the following particulars you are required to prepare a statement showing : (a) The cost of mate ials consumed, (b) Prime cost, (c) Works cost, (d) Total cost, (e) The percentage of works overhead on productive wages and (f) The percentage of Office and General expenses on works cost.

	Rs.
Stock of Finished Goods –31st Dec. 1982	72,800
Stock of Raw materials –31st Dec. 1982	33,280
Purchase of Raw materials	7,59,200
Productive Wages	7,59,200
Sale of Finished Goods	27,23,500
Stock of Finished Goods– 31st Dec. 1983	78,000
Stock of Raw materials--31st Dec. 1983	35,360
Works overhead charges	3,03,680
Office and General expenses	3,64,000

The company is about to send a tender for a large plant. The costing department estimates that the materials required would cost Rs. 52,000 and the wages to workmen for making the plant would cost Rs. 31,200. What should be the amount of the tender if same percentage of profit on selling price is desired ?

20. In a factory two types of radio sets are produced namely, 'De Luxe' and 'Popular'. Labour cost of 'De Luxe' type is one and a half times that of 'Popular' type. In 1982, 1,000 'De Luxe' sets and 2,400 'Popular' sets were produced : but 60% of the 'De Luxe' sets and 80% of the 'Popular' sets were sold during the year, there being no opening finished stock or work-in-progress. From the following particulars and the information given above ascertain the total cost of each type of radio sets.

	De Luxe	Popular	Total
Materials	Rs. 28,000	Rs. 42,000	Rs. 70,000
Labour	--	...	Rs. 78,000

Works overhead is 60% of labour cost and office overhead is 20% of works cost. Selling and distribution overhead is Rs. 25 and Rs. 15 per 'De Luxe' set and 'Popular' set sold respectively.

21. The books and records of Jahura Mfg. Co. present the following data for the month of August, 1983 :

Direct labour cost   Rs. 32,000 (160% of factory overhead) ·

Cost of goods sold   Rs. 1,12,000

Inventory accounts showed opening and closing balances as below :

	August 1 Rs.	August 31 Rs.
Raw materials	16,000	17,200
Work-in-progress	16,000	24,000
Finished goods	28,000	36 000

Other data :

	Rs.
Selling expenses	6,800
General and Administration expenses	5,200
Sales for the month	1,50,000

You are required to prepare a statement showing cost of goods manufactured and sold and profit earned.

22. The following data are available for 1983

	Rs.
Production 50,000 units	
Materials consumed	75.000
Direct Wages	50,000
Variable production overhead	1.00,000
Variable selling overhead	2,00,000
Fixed expenses	75.000
Selling price per unit	12

It is expected that in 1984 :

(a) Production will be 1,00,000 units.

(b) Prices of materils will go up by 33⅓%.

(c) Variable selling overhead and fixed expenses will rise by   and Rs. 25,000 respectively.

What would be the cost per unit and selling price in 1984, if it is desried to maintain the same rate of profit on sles as in 1983 ?

<div align="right">*(C. U., B. Com. Pass '84)*</div>

23. The Jay Engineering Co. Ltd. manufactured and sold 1,000 sewing machines in 1982.

Following are the particulars obtained from the records of the company :

	Rs.
Cost of Materials	80,000
Wages paid	1,20,000
Manufacturing expenses	50,000
Salaries	60,000
Rent, rates and insurance	10,000
Selling expenses	30,000
General expenses	20,000
Sales	4,00,000

The company plans to manufacture 1,200 sewing machines in 1983. You are required to submit a statement showing the price at which these machines would be sold so as to show profit of 10% on selling price.

The following additional information is provided to you :

(a) Price of materials will rise by 20% on the previous year's level.

(b) Wage rates will go up by 5%.

(c) Manufacturing expenses will rise in proportion to the combined cost of materials and wages.

(d) Selling expenses per unit will remain unchanged.

(e) Other expenses will remain un ffected by the rise in output.

24. In respect of a factory, the following figures have been obtained for the year ended 31st December, 1982 :

	Rs.
Cost of Materials	1,50,000
Direct wages	1,25,000
Factory overhead	75,000
Administration overhead	84,000
Selling overhead	56,000
Distribution overhead	35,000
Profit	1,05,000

A work order ha been issued in 1983 and the following expenses have been estimated :

	Rs.
Cost of Materials	3,000
Direct Wages	2,000

Assuming that in 1983, Factory overhead will go up by 20%, Distribution overhead will go down by 10%, and Selling and Administration overheads will each go up by $12\frac{1}{2}\%$, at what price should the product be sold, so as to earn the same rate of profit on the selling price as in 1982.

Note Administration. Selling and Distribution overheads. are based on works cost.

25. The following figures are extracted from the Trial Balance of Taparia Co. on 30th September, 1987 :

Opening Inventories	Rs.	Rs.
Finished stock	80,000	
Raw materials	1,40,000	
Work-in-process	2,00,000	
Office appliances	17,400	
Plant & Machinery	4,60,500	
Buildings	2,00,000	
Sales		7,68,000
Sales returns and rebates	14,000	
Materials purchased	3,20,000	
Freight incurred on materials	16,000	
Purchase returns		4,800
Direct labour	1,60,000	
Indirect labour	18,000	
Factory supervision	10,000	
Repairs and upkeep Factory	14,000	

	Rs.
Heat, Light & Power	65,000
Rates & Taxes	6,300
Miscellaneous factory expenses	18,700
Sales commission	33,600
Sales travelling	11,000
Sales promotion	22,500
Distribution Deptt. Salaries and Expenses	18,000
Office Salaries & Expenses	8,600
Interest on borrowed fund	2.000

Further details are available as follows :

(i) Closing inventories :

	Rs.
Finished goods	1,15,000
Raw materials	1,80,000
Work-in-process	1,92,000

(ii) Accrued expenses on ·

Direct labour	8,000
Indirect labour	1,200
Interest on borrowed fund	2,000

(iii) Depreciation to be provided on :

Office appliances	5% ,
Plant and machinery	10% ,
Buildings	4% ,

(iv) Distribution of the cost as below :

Heat, Light and Power to Factory, Office and Distribution in the ratio 8 : 1 : 1.

Rates and Taxes two-thirds to Factory and one-third to office.

Depreciation on Buildings to Factory, Office and Selling in the ratio 8 : 1 : 1.

With the help of the above information, you are required to prepare a condensed Profit & Loss Statement of Taparia Co. for the year ended 30th September, 1987 along with supporting Schedules of :

(i) Cost of Sales,

(ii) Selling and Distribution expenses,

(iii) Administration expenses.

SECTION I

INTRODUCTION

In production, raw materials and general supplies are used. Raw materials and general supplies are called '*Stores*' and finished goods are referred to as '*Stock*'.

Expenditure incurred on different elements of cost in respect of a production constitutes cost. So efficient accounting for all expenditure elementwise is an essential requirement. Thus, material accounting is of no less importance than wages accounting or overhead accounting.

In order to obtain efficiency in material accounting the following features must be obtained in stores organisation :

(i) There must be an efficient store-keeper who must be responsible for receipt, storage, issue of materials etc. and for maintaining adequate stores records.

(ii) There must be adequate storage facilities so that there is no wastage or deterioration of stores and finished goods.

(iii) There should be adequate stores staff to assist the store-keeper in respect of – (a) placing the stores safely and in a systematic and accessible manner, (b) receiving and issuing the stores on the basis of appropriate documents, (c) placing purchase requisition in time, (d) protecting stores from deterioration, theft piiferage etc., (e) recording the receipts, issues and balances, (f) bringing to the notice of the management the useless stores etc.

(iv) *The store-keeper must be given the following instructions to follow* :

(a) Receive the materials from the suppliers along with the delivery note and a copy of the buying order ; check up the quantity and quality of the materials with reference to order-quantity and specification , if found in order, initial the copy of the buying order and send the same together with the delivery note to the buying department. If, however, the delivery is not in accordance with the order, a separate report in details has to be sent to the buying department without delay, along with the copies of the buying order and the delivery note. (Materials supplied by the supplier are passed on to the store-keeper by the gate-keeper along with the delivery note etc. Quality is sometimes checked by the inspection department. In big organisations there are separate departments for receiving and for inspection. They receive and inspect the materials and then pass on to store).

(b) Place the materials in the respective racks, bins or containers without delay.

(c) Make entry in the *'received column'* of the *'bin card'* for the materials received and placed in and strike out the balance including this quantity received.

(d) Issue the materials in accordance with the valid *'requisition'* signed by the foreman, make entry in the *"issued column"* of the bin card, strike out the balance after issue and forward the requisition to the costing department.

(e) Place *purchase requisition* to the buying department as soon as the stock level as per bin card reaches the *'ordering level'* mentioned in the bin card. In respect of a new item of material, place *'purchase requisition'* on the basis of *bill of material* received from the production planning dep rtment.

(f) Make the identification of material easy by using *code*. The code should consist of symbol and numbers. For example, 'O' may be the symbol for oil. O5 may be the symbol of linseed oil. In case of punch card accounting, numbers with points may be used. For example, oil may be indicated by 21 and 21·05 may indicate linseed oil and so on.

The code system or numerical identification helps the cost clerks do their job more quickly.

<center>SECTION II</center>

MATERIAL CONTROL

The objectives of costing can only be fulfilled if the elements of cost can be properly controlled. Material cost, in many cases, is the most important element consuming a major part of the total cost of production. The importance of cost control in this sphere is, therefore, unquestionable. In order to control material cost we must exercise proper control on (1) *Purchase of material* and (ii) *Stores Function*, i.e., receipts, holding and issues.

Control of purchase of material

This is probably the most important part of Material Control. In small concerns purchases are done usually by the proprietor or his manager, but in any big concern there is a Purchase Department. How many workers and executives shall constitute a *purchase department* depends upon the size of the organisation. Normally, the chief of the purchase department is the Purchase Manager or Purchase Officer. The chief of the department is responsible for all the purchases. Success of any organisation depends much upon the efficiency of the purchase department, particularly when the market is competitive. Thus, in order to discharge his duties efficiently, a chief of purchase department must possess the following qualifications :

(a) Technical knowledge of the organisation ; (b) Knowledge about the items of materials required by the organisation with reference to its sources, market price, market trends, substitutes etc. ; (c) Uptodate knowledge of government policy with regard to restriction on import or export of the materials required by the organisation ; (d) Knowledge about the deeds of purch se, procedure for import, procedure for carrying the goods by road,

railways or air ; (e) Knowledge about insurance ; (f) Knowledge about the nature of supply of materials ; (g) Power of understanding the financial position of the prospective suppliers ; (h) Knowledge for working out the *economic order quantity.*

Besides the above, the chief of the purchase department, as any other chief, must be honest and sincere. He should be a man of high integrity. He must have power to manage his staff efficiently. He must know the policy of the organisation as well as its financial resources. He must be a good negotiator so as to enjoy the best advantage in any deal.

Taking for granted that a chief of purchase department possesses all the qualifications mentioned above, what is the nature of the job he has to perform ? *The following is the specification of the job of the Purchase Manager :*

(a) Preparing budget for the Purchase Department.

(b) Helping the Engineering Department in developing standards for materials.

(c) Fixing grades of materials.

(d) Preparing a list of approved suppliers on long-term basis at agreed price.

(e) Preparing manual of sources of supply.

(f) Receiving purchase requisition, calling tenders & selecting suppliers wherever necessary, placing formal orders and making follow-up process.

(g) Checking the materials received as per store-keeper's note with refe ence to quality and quantity ordered.

(h) Making arrangement for return of materials received in excess or materials not supplied as per specification.

(i) Making settlement with suppliers when excess materials or materials varying from specification are accepted.

(j) Checking the invoice and sending the same with advice to the Accounts Department for payment.

(k) Making market research for taking the best advantage on purchase.

Centralised Vs. Decentralised Purchase

In organisations where production centres are many in number at distances, it may be an important issue to decide whether there should be one *purchase department* to purchase for all the production centres or there should be one purchase department for each production centre. The decision shall depend *primarily* upon—(a) the distance between the production centres and the central godown, (b) the nature of the m terials used i.e., bulky, heavy, fragile etc., (c) the cost of transport, (d) the policy of the firm in this respect ; and *secondarily* upon the comparative advantages and disadvantages of the two systems.

Where there is one purchase department to purchase for all, it is referred to as *Centralised Purchase.* When there is a purchase department for each production centre, it is referred to as *Decentralised Purchase.* Let us examine the comparative advantages and disadvantages of the two systems.

From the point of view of :	Centralised Purchase	Decentralised Purchase
1. Control	Better control is exercised on buying.	Effective control may not be present.
2. Terms of purchase	Better terms of purchase may be available due to large-scale order.	Less favourable terms may be available.
3. Departmental skill	Better skill of the staff leading to economy in purchase can be obtained.	Skill of the staff may not develop up'o the mark.
4. Efficiency	Due to specialisation, efficiency is obtained.	Purchase by departmental heads loaded with other work can not be expected to be efficient.
5. Standardisation of materials	All departments can get standard materials purchased by Centralised Purchasing Department.	Standards of materials may vary from department to department.
6. Economy of staff, accommodation and finance	Centralised purchase brings economy of staff and accommodation and also of finance, because excess of stores need not be held.	Decentralised purchase requires more staff and more accommodation (all taken together) and also more finance to purchase.
7. Regulation of purchase policy	It is easy to regulate purchase policy and give prompt effect to any change in case of centralised purchase.	Change in purchase policy cannot be easily given effect to in case of decentralised purchase.
* *	* * *	* * *
8. Initial cost	Initial cost is higher.	Initial cost is lower.
9. Promptness in supply of materials for production	Supply cannot be expected to be prompt, there may be bottleneck even.	Supply is prompt and normally without bottleneck.
10. Transport cost	Transport cost from central godown to production centres is considerable.	Transport cost from departmental godown to production centres is practically nil.
11. Risk in transport	Fragile items are subject to risk.	No risk is involved.
12. Local purchase	Advantage of local market can not be obtained.	Advantage of local market can be enjoyed.
13. Inter-departmental relation	Central supply may sometimes be criticised for favouritism and there may also be misunderstanding between production centres and the Central Purchase Department.	Chances of misunderstanding are absent.
14. Blocking of capital	More working capital is blocked, sometimes unnecessarily.	Unnecessary blocking of working capital can be avoided.

N.B. :   Points 1—7 go in favour of Centralised Purchase. but against Decentralised Purchase and points 8—14 go in favour of Decentralised Purchase, but against Centralised Purchase.

To conclude, it may be generalised that—

(a) *Centralised Purchase* is suitable where—

    (i) there is one plant or several plants closely situated ;

    (ii) one basic raw material is used by the plant or plants for production of standard products.

(b) *Decentralised Purchase* is suitable where—

    (i) there are several plants distantly situated ;

    (ii) different raw materials are used by the plants for producing different products.

The above cannot be the firm conclusion, because plants distantly situated, but using very costly (but light) raw materials may be benefited by centralised purchase owing to the facts that cost of transport is negligible and better control on material can be obtained.

Purchase Procedure

While discussing the specification of the job of a Purchase Officer, the purchase procedure was more or less mentioned. The routine functions of the purchase department may be mentioned as below :

    (a) Receiving requisition for purchase ;

    (b) Ascertaining the sources of supply and selecting the supplier ,

    (c) Placing formal purchase order and going to follow-up delivery :

    (d) Receiving and checking the materials ;

    (e) Checking the invoice and passing the same for payment.

When the purchase department receives requisition for purchase it understands that it is the time to purchase, i.e., it comes to know *when to purchase, what to purchase* and *how much to purchase.* When it explores the sources of supply it knows *where to purchase* and at *what price to purchase.*

Let us examine the routine functions mentioned above one by one.

A. Receiving Purchase Requisition

Purchase department receives purchase requisition from various sources, namely :

(i) *From store-keeper* in respect of materials regularly stored. Store-keeper sends the requisition as soon as the stock reaches the *ordering level* mentioned in the *Bin Card.*

(ii) *From the production control department* in respect of any special material required for a special job. A *bill of material* is prepared by the planning and drawing department and on the basis of this requisition is sent. Alternatively, the planning and drawing department prepares a *bill of material* a copy of which is sent to the store, and the store-keeper on this basis sends the requisition.

(iii) *From the plant engineer or works manager* in respect of materials for special maintenance or construction.

(iv) *From any other department* in respect of materials the stock of which is not normally maintained, for example office stationery, first-aid materials, fire kings etc.

Every purchase requisition must be in prescribed form and prepared in *triplicate* and duly signed by the person authorised to do so. A valid purchase requisition authorises the purchase department to purchase. Original of the three copies is sent to the purchase department, the duplicate is sent to the production control department and the triplicate is retained by the department making the requisition as office copy.

A proforma of a purchase requisition is as below :

<div>

LINDWAL LTD.
Purchase Requisition

No...... . ...
Date........... .. ..
Desired date of delivery...... ... .

Sl. No.	Description of Materials	Code No.	Quantity Required	Quantity in Ealance & daily consumption	Remarks

Prepared by.. ....   Checked by............   Approved by ....

for use by purchase deptt.

Date	Purchase order No.	Name of supplier	Date of delivery	Remarks

Purchase Officer..............

</div>

As already mentioned, the planning and drawing department prepares a bill of material whenever a new work order is undertaken. The production planning department or the store-keeper may send a purchase requisition on the basis of the bill of material. Let us examine what is referred to as a bill of material and what purposes it serves.

Bill of Material

It is a complete schedule of materials, spare parts etc. required for a particular job or work order. Whenever a new job or work order is undertaken, the planning and drawing department prepares a bill of material for

the same. For standard products printed form may be used for preparing the bill of material. In case of new products a new form may have to be prepared.

A bill of material serves as a specification of materials required for a job to be executed. It also serves as an advance information to all concerned with the execution. On this basis purchase requisition can be sent so that materials can be procured in time. The production department is authorised by this bill of material to draw materials from stores. *Accounting by exception* can be introduced on the basis of the bill of material. (Materials as per bill are debited to the Work Order A/c. Any over or under drawing of material is debited or credited respectively to the Work Order A/c.)

The following is the simplest form of a bill of material :

LINDWAL LTD. Bill of Material										
No............... Date.............						Order No........... Job .... Assembly Drawing No .... Output				
Materials			Spare Parts			Remarks	For use of Purchase Deptt.			
Des-cription	Code No.	Quantity required	Des-cription	Symbol No.	No. required		Requisition No. with date	Order No.	Date of Delivery	Re-marks
Purchase Deptt. Copy			Date of Order............ Date of Delivery.........			Prepared by...... Checked by.......	Purchase order given by...........			

B. Ascertaining the sources of supply and selecting the supplier

This function of the purchase department covers—(i) Inquiry as to where the material may be available, calling tenders or price quotations etc. (ii) Scrutiny of the tenders or price quotations, and (iii) Selecting the appropriate supplier. Thus, the function ascertains *where to purchase*. Let us explain the above.

(i) The purchase department should know the sources of the materials used by the organisation. In case of new material required for a new work order proper inquiry must be instituted so as to ascertain the various sources available. Past records, quotations, catalogues, press advertisements, published statements etc. help in this respect.

Tenders may be of various types—

(a) Where there is only one source of supply tender called from them is termed as SINGLE TENDER.

(b)   When tenders are called from a small number of suppliers such tenders are termed as RESTRICTED TENDERS.

(c)   When tenders are called from all suppliers openly through newspapers, journals or other media of advertisement, such tenders are termed as OPEN TENDERS.

(ii) Scrutiny of the tenders and price quotations include, opening tenders or quotations (which are normally received in sealed covers) by a very responsible officer on the date and time stipulated and tabulation of the tenders or quotations in a statement called schedule of tenders/quotations. One statement for each item of material is to be prepared. The statement should mention the name of the material at the top and then the names of the suppliers, minimum quantity of supply, rate, time of delivery, terms of delivery, other terms and remarks. This statement, therefore, helps the purchase department in selecting the appropriate supplier.

(iii) Selecting the supplier is a matter of judgement. Price, quality, samples, grade etc. ; discount rate, terms of delivery, time of delivery, terms of payment, financial resource of the prospective supplier, his goodwill, past experience with him, if any etc. are the factors to be considered before deciding on the issue. Schedule of tenders/quotations prepared, past records, buyers' guide books and other books of relevant information will help the purchase department in this respect. The purchase department must fulfil its objective of buying the right quantity of right quality at right time and at the cheapest price.

C.   Placing formal Purchase order and going to follow-up delivery

When selection of the supplier is over the purchase department has to issue a formal purchase order to the supplier. This order binds the buyer and the seller into a contract subject to acceptance of the order by the supplier whenever necessary. When a supplier sends a formal price quotation it becomes an offer. When the buyer sends the purchase order it becomes an acceptance. If the order is placed within reasonable time or before the offer lapses or before the offer is revoked such placing of order creates a contract and supplier becomes obliged to deliver the goods and the buyer also becomes obliged to accept delivery of the goods.

Before placing purchase order the purchase department must ensure that the amount of the order is within the purchase budget limit or the financial allocation for the purpose. If the amount exceeds such limit, prior sanction of the additional amount must be obtained from the finance department of the organisation.

The purchase order should be prepared in *five copies* (or at least three copies in case of small organisations) for sending to the—(i) Supplier, (ii) Receiving department, (iii) Department making the purchase requisition, (iv) Accounts department, (v) Purchase order file.

Placing a formal purchase order is not enough unless it is ensured that goods shall be delivered timely. The purchase department shall have to

follow it up. A schedule of stipulated dates of supply, serially, should be prepared. The supplier should be reminded, from time to time, of their obligation to supply on prescribed date. Mutual co-operation may be required in this respect to ensure timely supply. In case of delay, penalty may be imposed as per the terms of contract by the affected party, but such 'cure' often becomes costly and hence 'prevention' is always considered better than 'cure'.

The following is a specimen form of a formal purchase order :

LINDWAL LTD.
Purchase Order

To   No............
   M/s............(Name of Supplier)   Date...........
                                                            Ref. No............
                                                            Purchase Requisition-No.........

Dear Sirs,
   Your offer contained in your quotation No............Dated............is hereby accepted. Please supply the following materials as per terms and conditions mentioned overleaf :

Item No.	Code No.	Description	Quantity	Rate	Value	Delivery date	Remarks

Excise Duty
Sales Tax
Discount Allowed
Package charged
Package to be credited on return
Carriage on delivery   Purchase Officer/Manager
Terms of payment   *for* **LINDWAL LIMITED**

D. Receiving and Checking the materials

In small and medium sized organisations the store-keeper receives the goods supplied by a supplier. (So, in this case, there is no separate Receiving Department and the store-keeper receives a copy of the purchase order which, in big concerns, is received by the Receiving Department.) The store-keeper inspects the goods with reference to quality and quantity. In big concerns, however, there are separate Receiving and Inspecting Departments. The following is the routine work in this respect :

   (i) Get the challans and invoices and unload the materials.

   (ii) Make a physical survey, regarding the number of packs, physical conditions outwardly shown etc.

   (iii) Unpack the materials, mark them, make physical verification of the quantity received with reference to the challan and the

· purchase order, bring to the notice of the supplier any shortage, breakage or surplus.

(iv) Check the quality of the material with reference to the sample or grade. (Sometimes laboratory testing is done by the Inspecting Department where the e is such a separate department. The *report of testing* i prepared in triplicate—one for office copy, the second for the Receiving Department and the third for the Purchase Deptt.)

(v) Sign the challan and return a copy to the supplier as acknowledge ment of re eipt.

(vi) After all the above have been done, the Receiving Department will prepare the *Goods Received Note* in five copies of which the original is to be retained, the others are to be sent to the Purchase Deptt., the Accounts Deptt., the store-keeper (if he himself does not receive the material) and the department making the purchase requisition.

On the basis of the Goods Received Note entries are made in the Stores Ledger.

The following is a Specimen of Goods Received Note.

LINDWAL LTD.
Goods Received Note

From...........

No...........
Date........ ...
Delivery Note No./Challan No ....

Item No.	Description	Code No.	Purchase Order No.	Quantity Ordered	Quantity Received	Quantity Rejected	Net Quantity Received	Rate	Value	Re-marks

Transport	Bill No.	Stores Ledger	Accounts Ref.	Inspection done by

Signature
Designation.

Note : The columns for 'Rate' and 'Value' are filled in by the Cost Deptt.

If physical supply of materials is found less than the quantity mentioned in the challan and the invoice or if some items are rejected, the fact of such shortage or rejection must be noted in the challan before ending a copy to the supplier as acknowledgement of receipt. A *Debit Note* is to be prepared in respect of the value of such shortage or rejection. Such value must be deducted from the total value of the invoice. A copy of the debit note should be sent to the supplier for similar adjustment of value in their books. If, however, material are found in excess, it should be noted in the challan. Negotiation should be made with the supplier regarding the surplus. If the supplier takes the surplus materials back, necessary gate pass should be issued. If it is taken by the buyer, a *Credit Note* is to be prepared in respect of the value of the surplus materials. Such value must be included in the value of the invoice and such materials must be included in the 'Net quantity received' column in the goods received note.

E. Checking the Invoice and passing the same for payment

Invoice (i.e., Bill) in respect of the materials supplied by the supplier is usually sent by the supplier together with the challan along with the goods. The invoice is to be checked with reference to Purchase Order, Goods Received Note, Inspection Report, Debit or Credit Note. Quantity ordered, rate, terms of delivery, terms of payment etc. are mentioned in the purchase order. It must be seen whether all the terms and conditions have been fulfilled or not. Goods Received Note states net quantity received. Inspection Report approves the quality of the material, Debit or Credit Note says the quantity of short or excess supply. The invoice figures are to conform with the goods actually received at the agreed rates. So, adjustment of the invoice price in respect of short or excess supply, inappropriate rate charge or wrong calculation, shall be required. Any violation of terms involving penalty is to be taken up with the supplier for settlement of final claim.

After checking the invoice carefully on each of the points mentioned above, if an invoice is found correct, endorsement is made on the invoice to that effect and the invoice is passed on to the Accounts Department (under the signature of Purchase Officer/Manager) for payment.

When an invoice is to be altered for any reason (e.g., short or excess supply, wrong calculation, wrong rate etc.), it should be altered and the supplier should be informed through Debit or Credit Note which shows the reasons for alteration.

Constituents of material cost

When materials are purchased we do not pay for the materials only. We also pay sales tax, excise duty, octroi, freight, insurance etc. We are also to pay, sometimes, the cost of packing or hire charge for packages. At the same time we often enjoy trade discount and cash discount. A question may, therefore, arise : What are the constituents of material cost ? The material costs include the following :

(i) *Invoice price*—It is the price of materials calculated at the agreed rate subject to deduction of trade discount, if any.

(ii) *Excise duty, Sales tax, Octori etc.*—These are the levies made by the governments on production or sales. So, these are included in the cost of materials purchased.

(iii) *Freight, Insurance etc.*—Costs of bringing the materials from supplier's end, when borne by the buyer, are included in the cost of materials. Thus, carriage inward is included in the cost of materials. Insurance cost on inward goods is also included in the cost of materials.

(iv) *Packing Cost*—If packing cost is charged in addition to the invoice price, such cost is a part of the cost of materials. When m terials are delivered in returnable packages which are charged to buyer and credit is given to the buyer at a lower rate on return, the difference between the rate charged and the rate credited means hire charge (or rental) to be included in the cost of materials.

(v) *Cash Discount*—It refers to the deductions available in respect of invoice value, if payment can be made within the time prescribed. This is, therefore, a reward for good financial management and has got nothing to do with the purchase. *So, cash discount should not be deducted* in order to ascertain the cost of materials, although there is a controversy on this issue amongst the Cost Accountants.

Let us see an illustration.

Illustration :

Lindwal Ltd. sent a purchase order to American Paints Ltd. The terms are as below :

Quantity to be supplied 5,000 litres of Red Oxide @ Rs. 10/litre.
Trade Discount @ 20%.
Cash Discount @ 5% (terms 15 days).
Sales Tax chargeable @ 15%.
Octroi @ Rs. 5 per 100 litres.
Freight Rs. 300 for the entire consignment.
Insurance on the goods carried Rs. 50.
Delivery within 15 days in containers of 100 litres.

Each container is chargeable @ Rs. 20, but credit is allowed @ Rs. 15 on return within a month.

The material ordered were delivered as per terms and conditions, payment was made on the 10th day and containers were returned on the 23rd day from the date of delivery. Calculate the cost of material purchased.

Solution :

	Total Cost of 5,000 litres Rs.	Cost per litre Rs. P.
Agreed price	50,000	10·00
Less : Trade discount @ 20%	10,000	2·00
	40,000	8·00
Sales Tax @ 15%	6,000	1·20
Octroi @ Rs. 5/100 litres	250	0·05
	46,250	9·25
Freight	300	0·06
Insurance	50	0·01
	46,600	9·32
Rental of Packages 5000/100 (Rs. 20 – Rs. 15)	250	0·05
Cost of material	46,850	9·37

Note : Cash discount is available @ 5% on Rs. 46,600.

SECTION III

STORES ROUTINE

In Indian industries, as much as 80% to 90% of the capital may be invested in materials. So, unless the stores are efficiently managed, serious losses may have to be suffered. While managing the stores efficiently the m in objectives that must be fulfilled are mentioned below :

(a) Receiving and issuing materials smoothly.

(b) Maintaining stocks at desired levels.

(c) Protecting stock from pilferage, theft evaporation, deterioration, sublimation etc.

Stores may be of three types depending on the type of industry, size of the business, location and policy of the management .

(i) *Centralised Stores* i.e., one store to supply materials to all departments.

(ii) *Decentralised Stores* i.e., a separate store for each department.

(iii) *Centralised Stores with sub-stores* i.e., One Central Store holding the stock in general with separate sub-stores for each department getting supply from the Central Stores.

The store receives materials from the receiving department and supplies materials to the production and service departments. So the *location* of the store should be near the receiving department, and at the same time, it should be situated near the departments requiring supply from it. The main considerations for the location and layout of stores are – (i) *Highest efficiency* ; (ii) *Lowest cost of internal transport* and (iii) *Easy accessibility to all departments that require materials.*

The features of stores organisation desirable for efficient material accounting have been discussed in the introduction to Chapter 3. The main routine work of the store-keeper have also been mentioned there.

We have mentioned above three types of stores. Let us examine the *merits* and *demerits* of each type.

Centralised Store has the following merits :

(i) Better control, (ii) Better layout, (iii) High technical skill, (iv) Less storage space, because stocks are kept as low as possible, (v) Quicker replenishment, (vi) Better supervision, (vii) Less clerical work, stationery and other costs, because record of same material need not be maintained in different departments, (viii) Better facility for stores audit, (ix) Easier stock t.king, (x) Lower cost of insurance, etc.

Centralised store has the fo'lowing demerits :

(i) Higher cost of internal transport, (ii) Possibility of bottle-neck in the flow of materials to production, (iii) Greater risk of obsolescence, (iv) Any disturbance affects all the production departments.

Merits and demerits of decentralised stores :

Merits—(i) Cost of internal transport is avoided,

　　　　(ii) Disturbance in the central store can not affect production,

　　　　(iii) Delay in getting the issues is avoided,

　　　　(iv) Lower chance of obsolescence.

Demerits—(i) Separate store for each department increases cost of organisation and space,

　　　　(ii) Departmental heads will have to maintain the store in addition to their normal work,

　　　　(iii) Less technical skill is obtainable.

Centralised store with sub-stores : In this case, a central store is located near the receiving department and each department has a sub-store with it. The sub-store receives materials from the central store on *imprest system* and makes issue to the department.

This system is essential when the work sites are at long distances from the central store. The system avoids the bottle-necks in the supply of materials for production. The system is, however, costlier than the centralised store.

LEVELS OF STOCK

In stores records, different levels of stock are mentioned. The levels are : (a) *Minimum level* below which the stock must not go at any time, (b) *Maximum level* above which the stock must not move at any time and (c) *Ordering or re-ordering level* which being re.ched by the actual stock, the purchase requisition is required to be sent to the buying department, (d) *Danger level* which being re.ched by the actual stock, very urgent measure for purchase is needed.

Minimum level : While fixing the minimum level the following factors are to be taken into consideration :

(a) *Nature of the material.* Materials that are regularly stored must have a minimum level to be maintained. If on customer's order a special

item of material is to be purchased, no minimum level is required to be fixed for that.

(b) *The maximum time required from the date of order to the date of actual delivery.* It is known as the *Lead Time.* The longer the lead time, the lower is the minimum level, provided the re-order point remains constant.

(c) *Rate of consumption of the material.* The minimum rate, the maximum rate and the normal rate of consumption are to be taken into consideration.

Maximum level : While fixing the maximum level the following factors require consideration :

(a) *Rate of consumption of the material.*

(b) *The lead time.*

(c) *The maximum requirement of the material at any time.*

(d) *Nature of the material.* The materials which deteriorate quickly is stored as little as possible.

(e) *Storage space available for the material.*

(f) *Price economy.* Seasonal materials are cheap during the harvesting seasons. So maximum purchase is made during the harvesting season and as a result the maximum level is high.

(g) *Cost of storage and insurance.*

(h) *Cost of the material and the finance available.* When the material is costly the maximum level is likely to be low. If the price is likely to go up maximum level should be high.

(i) *Inventory Turnover.* In case of slow moving materials the maximum level is low and in case of quick moving material the maximum level is high.

(j) *Nature of supply.* If the supply is uncertain the maximum level should be as high as possible.

(k) *Economic ordering quantity (EOQ).* Maximum level largely depends on economic ordering quantity, because unless otherwise contraindicated the economic ordering quantity decides the quantity ordered and hence influences the maximum level.

Re-ordering Level · This level is fixed between the minimum level and the maximum level. This is fixed in such a manner that the excess of ordering level over the minimum level is sufficient to meet the requirement during the lead time. Thus, the minimum level, the rate of consumption and the lead time are the main factors to be considered while fixing the re-ordering level.

The following formula may be used for working out the above levels

Maximum level = Re-order level *plus* re-order quantity *minus* (minimum usage × minimum order period)

(Explanation—The actual stock level on the date on which the quantity ordered shall be received, will be the quantity ordered *plus* re-order level *less* the minimum consumption during the least lead time.)

Minimum level = Re-order level *minus* (normal usage × normal i.e., average re-order period)

(Explanation—If the usage is normal, the level will not go below this, by the time the actual delivery against the order is received.)

Re-ordering level = Maximum re-order period × Maximum usage

(Explanation—Even if maximum consumption takes place, the stock shall just reach zero level by the maximum lead time.)

Average stock level = ½ (Minimum level + Maximum level.)

Illustration 1.

Two materials, x and y, are used as follows :
Minimum usage—50 units per week each.
Maximum usage—150 units per week each.
Normal usage—100 units per week each.
Ordering quantity—x—600 units and y—1,000 units.
Delivery period : x—4 to 6 weeks
y—2 to 4 weeks.

Calculate for each material : (a) Minimum level, (b) Maximum level, (c) Ordering level, (d) Average stock level.

Solution :

Ordering level = Maximum usage × Maximum delivery period

x : 150 × 6 = 900 units
y : 150 × 4 = 600 units

Minimum level = Ordering level
—(Normal usage × Normal delivery period)[1]

x : 900 − (100 × 5) = 400 units
y : 600 − (100 × 3) = 300 units

Maximum level = Ordering level + ordering quantity
—(Minimum usage × Minimum delivery period)

x : 900 + 600 − (50 × 4) = 1,300 units
y : 600 + 1,000 − (50 × 2) = 1,500 units

Average stock level = ½ (Minimum level + Maximum level)

x : ½ (400 + 1,300) = 850 units
y : ½ (300 + 1,500) = 900 units

Note : [1]Normal delivery period is taken to be the average delivery period, i.e. 4½ or 5 weeks for x and 2½ or 3 weeks for y.

Danger Level : As mentioned earlier, in addition to the minimum, maximum and re-ordering levels there is another level called *Danger level,*

This level is below the minimum level and when the actual stock reaches this level urgent measure is to be taken to replenish stock. When the normal lead time is not available, the purchase quantity can not be accurately fixed. So it is fixed in such a way that the actual stock does not fall below danger level by the actual lead time. This means, that the minimum level contains a cushion to cover contingencies.

Some concerns fix danger level below the re-ordering level but above the minimum level. If action for purchase is taken as soon as the stock reaches the re-ordering level, the danger level bears no significance except that, when the stock reaches the danger level (but not yet the minimum level) a reference may be made to the purchase department to ensure that delivery is received before the actual stock reaches the minimum level.

When the danger level is fixed below the minimum, it being reached by the actual stock, the defect in the system is detected and *corrective measure* becomes necessary. When the danger level is fixed above the minimum, it being reached by the actual stock, *preventive measure* is to be taken so that the stock may not go below the minimum level.

ABC System

While acquiring materials, economy in purchase is the striking point to consider. In order to achieve economy, all the items of stock are classified into three classes—'A', 'B' and 'C'. 'A' indicating a small number of items each requiring heavy investment, 'C' indicating a large number of items for which total investment required is not much and 'B' indicating the items between 'A' and 'C' i.e., number of items in 'B' is less than that in 'C', but more than that in 'A' and the total investment is less than that in 'A', but more than that in 'C'.

Since the investment in 'C' items is not large the stock may be acquired for a year. This will save the cost of placing orders and receiving materials. In case of 'B' items, orders may be placed as and when the stock reaches the ordering level. If the stock is proportionately low, order for 4-5 months consumption may be placed. So far as 'A' items are concerned, it is necessary to work-out the exact quantity of each order economically justified (known as *economic order quantity* or *EOQ*). This is how the purchase of material is selectively controlled. It is obvious that the stock of 'A' items should be subject to more cautious control than that of 'B' items and 'C' items. The system of classification and control of materials indicated above is called ABC system.

Economic Order Quantity (*EOQ*)

If the consumption of a material is 12,000 units per annum, it is possible to buy 1,000 units monthly, 3,000 units quarterly, 12,000 units annually, or any other combination of order quantity and frequency of ordering.

The economic order quantity (*EOQ*) refers to that order quantity, within the range of possible order quantities, which minimises total costs per annum (and thus average cost per unit) for the items purchased. This total cost consists of two parts—(i) ordering costs and (ii) carrying costs.

Ordering cost is independent of the quantity ordered, while carrying cost (which includes storage cost, handling cost, upkeep expenses, insurance charges, cost of obsolescence etc. and the opportunity cost of the capital blocked i.e., interest) increases with the increase in the quantity ordered. Thus, ordering cost decreases as the size of purchase increases (because in that case the number of purchase decreases), but the carrying cost increases with the increase in the size of purchase. It is, therefore, necessary to find a balance between ordering costs and carrying costs in order to find the most favourable quantity.

A tabular presentation of information in respect of a particular item may help to have an idea on this matter :

Estimated usage per annum	12,000 units
Price per unit charged by supplier	Rs. 3
Ordering cost per order	Rs. 100
Stock carrying costs as a percentage of average stock value	20%

Based on the above information a schedule may be prepared to determine an economic order quantity as under :

No. of orders per annum	1	2	3	4	5	6	8	10	12
Order size $\left(\dfrac{\text{Total requirement}}{\text{No. of orders}}\right)$	12,000	6,000	4,000	3,000	2,400	2,000	1,500	1,200	1,000
Average stock $\left(\dfrac{\text{Order size}}{2}\right)$	6,000	3,000	2,000	1,500	1,200	1,000	750	600	500
Average stock value (Average stock × unit cost)	18,000	9,000	6,000	4,500	3,600	3,000	2,250	1,800	1,500
Stock carrying costs (20% of average stock value)	3,600	1,800	1,200	900	720	600	450	360	300
Ordering costs (No. of orders × order cost per order)	100	200	300	400	500	600	800	1,000	1,200
Total cost per annum (Carrying cost + Ordering cost)	3,700	2,000	1,500	1,300	1,220	1,200	1,250	1,360	1,5

From the above table it will be seen that stock carrying costs are low when the quantity ordered is small and they are high when the quantity ordered is large ; while ordering costs are high when the quantity ordered is small and they are low when the quantity ordered is large. Total costs are the lowest at Rs. 1,200, when the quantity ordered is 2,000 units. This is, therefore, the economic order quantity.

A graphical presentation of this table is shown below :
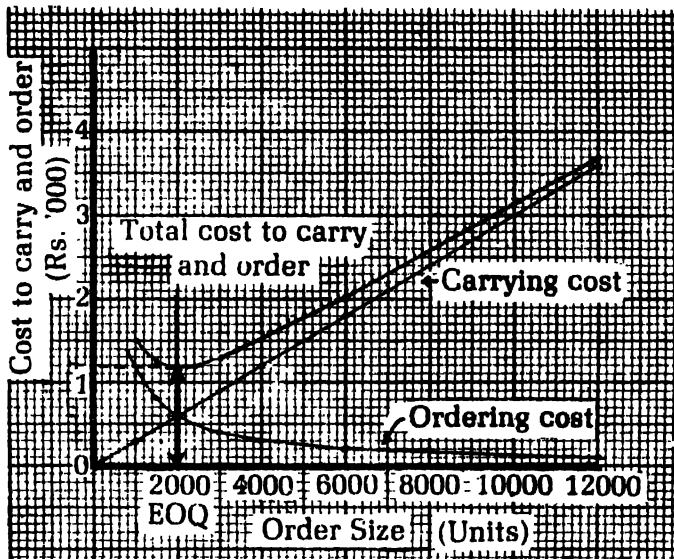
Determining the *EOQ* in tabular or graphical form is lengthy and may not provide an accurate solution. Mathematically it is possible to obtain the *EOQ* by the following formula :

$$EOQ = \sqrt{\frac{2C_0 O}{C_o}}$$

where C_0 = Consumption per annum (i.e., usage) in units
O = Order cost of placing one order
C_o = Carrying cost (including interest) of one unit for one year (usually expressed as a percentage of the cost per unit)

Taking the information previously used in the table and graph, we may obtain :

$$EOQ = \sqrt{\frac{2 \times 12,000 \times Rs. 100}{20\% \text{ of } Rs. 3}}$$

$$\sqrt{\frac{24,00,000}{0.60}}$$

$$= \sqrt{40,00,000} = 2,000 \text{ units (6 orders per annum)}$$

An alternative mathematical calculation is as follows :

EOQ shall lie at the point where the total ordering cost shall be equal to the total carrying cost. Let N represent the number of orders (each of economic quantity) per annum. The average stock is $\frac{12,000}{N \times 2}$, carrying cost is 20% of Rs. 3 or Re. 0·60 and total ordering cost is $N \times$ Rs. 100.

$$\text{Now, Re. } 0\!\cdot\!60 \times \frac{12{,}000}{N \times 2} = N \times \text{Rs. } 100$$

$$\text{or} \quad \frac{\text{Re. } 0\!\cdot\!60 \times 12{,}000}{2 \times \text{Rs. } 100} = N \times N$$

$$\text{Now, } N^2 = \frac{0\!\cdot\!60 \times 12{,}000}{2 \times 100} = 36$$

$$\text{or} \quad N = 6 \text{ times}$$

$$EOQ = \frac{\text{Annual usage}}{\text{No. of orders}} = \frac{12{,}000}{6} = 2{,}000 \text{ units}$$

Some problems involved in (or limitations on) the use of table, graph or mathematical formula for determining the *EOQ* are mentioned below :

(1) The assumption that all costs are known and constant (i.e. ordering costs, unit cost etc.) may not prove correct.

(2) Determining the carrying cost is a subjective matter based on estimates of interest rates which may vary.

(3) The assumption of a constant rate of consumption or usage throughout the year may not come true. There may be seasonal variations.

(4) The assumption that an economic order quantity can be set for an individual component having no regard to the manufacture of other components entering either into it or into further assemblies of which it forms a part may not hold good. It is possible for every component to be made in an economic order quantity, yet out of phase with other components, so that completed component stocks have to be held in waiting stores.

RECEIVING MATERIALS

Materials which are purchased by the purchasing department are received either by the Receiving Department or by the store-keeper himself. A Goods Received Note is prepared to record the goods received. Articles which are not purchased, but are produced by the factory itself, are mainly spare parts and components. In this case also Goods Received Note should be prepared after proper inspection so that all materials including spare parts and components come into the hands of the store-keeper along with a Goods Received Note.

After the materials are received, the store-keeper is to put the materials in respective Bin or Rack.

With each Bin or Rack there is a record showing the receipt, issue and balance after each transaction—inward or outward, only in quantity. This record is called Bin Card.

Bin Card is a record maintained in respect of each item of material to show the quantity in, the quantity out and the quantity in stock after

each transaction. The stock, at any time, shown in the Bin Card can be verified with the physical stock in the Bin. In the Bin Card the stock levels and the normal quantity of purchase are mentioned so that the levels can be properly maintained. The Cost Office also maintains a separate record for each item of material showing the inward and outward movements of the materials and the balance after each transaction not only in quantity but in value as well. This record is called *stores ledger*. To establish cross reference the Stores Ledger Folio No. is mentioned in the Bin Card and the Bin No. is mentioned in the stores ledger. These two documents control the materials to a great extent. The following is a specimen form of Bin Card.

LINDWAL LIMITED

Bin Card

Material—Description..... ... .   Maximum level............. .
            Code...........   Minimum level ....
Stores Ledger Folio No   . ...   Ordering level ....
Bin No. ....   Danger level. ....
     Normal Quantity of Purchase......

RECEIPTS			ISSUES			BALANCE		Audit Notes
Date	G.R. No. or Dr. Note No.	Quantity	Date	S. Req. No.	Quantity	Date	Quantity	

[*Note* : The reference of materials received is Goods Received Note No. (G.R. No.) in case of materials purchased and parts produced or Stores Debit Note No. in case of surplus materials returned to store from production departments.]

As an alternative to Bin Card, a *Stores Control Record* may be maintained. This will enable the store-keeper to have all details regarding the materials, close at hand, and to control materials and components effectively.

ISSUING MATERIALS

Materials are issued by the store-keeper only against a valid stores requisition. As soon as the issue is made an entry is passed in the ISSUE column of the Bin Card showing the Stores Requisition No. and quantity issued. Balance in the Bin Card is then and there struckout.

Stores requisition is an authorisation for issue of stores. It is prepared in prescribed form and signed by the foreman of the department making the requisition. It is, therefore, as valuable as a Bank Cheque. A Stores

Requisition must mention the name of the department asking for the issue ; the job or process for which material is required ; the description, code and quantity of materi 1 asked for etc. The store-keeper issues the materiel against the Stores Requisition and then the Stores Requisition is passed on to the Cost Office where the material issued is priced. The store-keeper makes entry in the Bin Card and the Cost Office makes entry in the stores ledger on the basis of the same stores requisition. The Cost Office also prepares *materials statement* periodically on the basis of stores requisitions served during any period for the purpose of material accounting.

Let us see the specimen of a Stores Requisition below :

LINDWAL LIMITED
Stores Requisition

Department... ....   No..................
JOB or Process... . . .   Date. ....

Description	Code	Quantity	Rate	Value	Remarks

Prepared by...... .. ..   Storeman ....   *Cost Office*
Authorised by............   Received by...................   Priced by..................
                                 Bin No ....   Checked by............ ..
                                 Stores Ledger Folio......

RETURN OF SURPLUS MATERIAL TO STORE

It is quite normal that materials may be issued in excess of the requirement and debited to the respective job or process. Surplus materials are returned to store along with a document called Stores Debit Note. The same document is used for transfer of scrap materials (suitable for re-use in other production or for sale) to store. Stores Debit Note is sometimes substituted by **Material Return Note** or **Shop Credit Note** for the same purpose. A Stores Debit Note *is* prepared by the foreman of the department returning the material. This should be done in duplicate. Both the copies should be sent to the store-keeper who will sign and return the carbon copy to the transferring department as acknowledgement of receipt. On the basis of the original copy the store-keeper will make entry in the Bin Card (receipt column) after placing the materials in the respective Bin and then send it (i.e., original copy) to the Costing Department where such materials shall be valued at the rate at which they were issued and entered in the Stores Ledger and credited to the job or work order account from where the materials were returned. There is no specific rule as to

whether materials returned should be treated as a new purchase in the store ledger or placed in the lot having the same rate, but materials returned should be placed in the stocks in a manner justified on the basis of the method used for pricing the issues.

Stores Debit Note is prepared, in this case, to ensure that the job or work-order gets appropriate credit in respect of the materials returned. The same document (i.e., Stores Debit Note) may be used for return of materials (issued and debited to the job/work order) for any other reason. The specimen form of a Stores Debit Note is given below :

LINDWAL LIMITED						
Stores Debit Note						
For Deptt...............				Sl. No		
Credit JOB/Work Order No.........				Date		
Item No.	Description	Code	Quantity	Rate	Value	Remarks
Prepared by.....................		Received by........................			Cost Office	
Authorised by.........		Bin No			Priced by..........................	
		Stores Ledger folio			Checked by	

TRANSFER OF MATERIALS FROM ONE SHOP TO ANOTHER OR FROM ONE JOB TO ANOTHER

In case of decentralised store, the store of one department may require transfer of material from the store of another department. Since there is no central store in case of completely decentralised store system, the transfer must be recorded in the Bin Card of the transferer store, in the Bin Card of the transferee store and also in the respective stores ledgers. No particular job or work order shall be affected by this. The transfer should be allowed by appropriate authority and effected through a document called **Material Transfer Note** prepared in triplicate. One copy after acknowledgement of receipt should be kept by the transferer store, one copy should be kept by the transferee store and the third copy should be sent to the Cost Department for valuation and entry in the respective stores ledgers.

In case of sub-stores with a central store also, three copies of the same document shall be enough. The first two copies shall be dealt with in the same way as above, while the third copy should be sent to the Cost Department *through the central store* where also entries shall be made in appropriate records.

In case of transfer of materials from one job to another it must be borne in mind that such transfer must not be allowed except in emergency.

Cost (Part I)—6

The following are some of the conditions which may be taken as appropriate for allowing direct transfer of materials from one job to another :

(i) A very urgent work has no material which a less urgent work possesses.

(ii) The material is bulky or heavy so that the cost involved in transfer of surplus materials from one job to the store and then in issuing the same from store to another job, is considerable.

(iii) The material is fragile so that the risk involved in returning the surplus to the store and then in issuing the same to another job from store, is too much.

(iv) The nature of the material is such that unless the surplus in one job is quickly consumed by another job in the neighbouring site, the material will be lost. For example, concrete mixture being surplus in one job must be used in another job quickly.

In case of transfer of material from one job to another the same document i.e., Material transfer note shall be used in triplicate. It will be prepared by the transferer job foreman. The transferee job foreman will sign all the copies on receipt of the transfer. One copy is to be sent back to the transferer job foreman, one copy is to be retained by him and the third copy is to be sent to the Cost Deptt. *for valuation of the material transferred and for debiting and crediting the transferee job and transferer job respectively.*

The following is the specimen fo m of a Material Transfer Note :

LINDWAL LIMITED					
Material Transfer Note					
From Deptt		Job No...............Cr.		Sl. No	
To Deptt.		Job No.............. Dr.		Date	
Description	Code	Quantity	Rate	Value	Remarks
Prepared by............		Received by...............		*Cost Office*	
Authorised by..........				Priced by.....	
				Checked by	

STORES LEDGER

Stores ledger is a document kept by the Cost Department for each item of material. The ledger is usually kept in loose-leaf or card-type form. In the stores ledger every movement of the material, either inward or outward, is recorded in quantity, rate and value and the balance of the

material, after each movement, is simultaneously struck out in quantity, rate and value. It is, therefore, a duplicate of bin card so far as the quantity is concerned and is also a step forward so far as the rate and value are concerned.

As in Bin Card, in the stores ledger also, different levels such as maximum level, minimum level and ordering level are mentioned. In addition to the name and code of material, information regarding the location of the material, normal source, lead time etc. is often mentioned. To establish cross reference, Bin No. is mentioned in the stores ledger and stores ledger folio is mentioned in the corresponding Bin Card.

Distinction between Bin Card and Stores Ledger can, therefore, be drawn as below :

Bin Card	*Stores Ledger*
1. The record is kept by the store-keeper.	1. The record is kept by the cost department.
2. It records the inward and outward movement of the materials and the balance after each movement, only in quantity.	2. It records the same thing, but in both quantity and value (rates of valuation also being mentioned therein).
3. Entries are made in the Bin Card when purchases or returns come in and when issues go out.	3. Entries are made in respect of purchase, return and issue, but after recording in Bin Card.
4. Since Bin Card is maintained where the materials are physically present, stores audit relating to physical verification of the material is done with reference to the balance in the Bin Card.	4. Stores ledger balance is not referred to in respect of the physical verification although stores ledger balance (quantity) and Bin Card balance should be identical at any time.
5. The officer-in-charge of the Bin Card is responsible for any discrepancy in materials.	5. The personnel-in-charge of the stores ledger is not responsible for any such discrepancy, as he has no connection with the materials.
6. Bin Card is a *stock record* in the true sense.	6. Stores ledger is a *stock control record*.
7. Bin Card can not supply inventory value for preparation of financial Profit & Loss Statement.	7. Stores ledger can supply inventory value to help preparing financial Profit & Loss Statement.

Bin Card	Stores Ledger
8. Posting in Bin Card is made for each individual transaction.	8. Posting may be made on the basis of summary of several transactions in the same material for a particular period.

Discrepancy between Bin Card balance and Stores Ledger balance

On the basis of the same documents entries are made in Bin Card and Stores Ledger. So the balance (quantity) in the two records, at any time, should be identical. Any discrepancy, therefore, may be due to any or more of the following reasons :

(a) Wrong entry in any or both.

(b) Wrong casting of balance in any or both.

(c) Where entries in Bin Card are made on the basis of individual transactions and entries in the stores ledger are made on the basis of summary of transactions (instead of individual transactions), discrepancy may arise due to wrong summary and also due to time-lag.

(d) Missing of documents in the flow may be another reason.

The two records i.e., Bin Card and Stores Ledger should be reconciled independently on the basis of documents that were used for entries at least once at the time of physical verification of stock. Casting of balances should be checked : missing document in the flow, if any, should be detected and entries in stores ledger on the basis of summary should be made complete. The adjustment in Bin Card in respect of discrepancy, if any, should also find place in the stores ledger.

The above reconciliation will ensure control on the materials (i.e., store) and also on the flow of documents and on casting of balances.

Discrepancy between Physical Stock and Stock as per Records.

In course of stores audit some difference may be detected between the physical stock and stock as per Bin Card. This difference may arise due to any or more of the following reasons which may be (i) avoidable normal reasons (ii) unavoidable normal reasons (iii) unavoidable abnormal reasons.

(i) *Avoidable normal reasons* :

(a) wrong entry in the Bin Card or wrong casting of balances,

(b) over or understatement in invoices (this can be rectified when physical goods are reconciled with the invoice at the time of receiving),

(c) over or under supply against requisition,

(d) placement of wrong material in the Bin or placement of material in the wrong Bin,

(e) breakage, spoilage, leakage etc.,

(f) pilferage, misuse by stores staff etc.,

(g) handling losses,

(h) loss due to improper storage etc.

The store-keeper is normally held responsible for discrepancies due to above reasons.

(*ii*) *Unavoidable normal reasons* :

(a) loss due to breaking bulk,

(b) loss by evaportion of volatile matters like petrol, spirit etc. and sublimation of solid matters like camphor, iodine etc.,

(c) gain in weight due to absorption of atmospheric moisture (as in case of sodium and potassium salts, sugar etc.),

(d) loss due to shrinkage, drying up etc.

(*iii*) *Unavoidable abnormal reasons* :

Fire, floods, riot, burglary are the unavoidable abnormal reasons of loss. Attempt to prevent the causes may be made, but the management has no absolute control over the causes.

Treatment of discrepancies in Stores in Cost Accounts

The value of deficiency or surplus *due to avoidable normal reasons* should be either adjusted against the value of materials consumed by job/ work order or against the stores overhead (which is a branch of factory overhead). In case of deficiency or surplus *due to unavoidable normal reasons* a percentage should be anticipated on the basis of past experience and the unit price of the materials is reduced or inflated to cover the cost of the normal percentage of surplus or deficiency respectively. Any difference between the anticipated and actual discrepancy is noted and the value is adjusted to stores overhead. For example, let 100 litres of spirit were purchased @ Rs. 10 per litre and the anticipated evaporation rate is 4% : the net quantity is, therefore, 96 litres against the cost of Rs. 1,000 , the rate of issue should be Rs. 1,000÷96 or Rs. 10·42.

The value of surplus or deficiency *due to unavoidable abnormal* reasons should not form a part of the cost of production. This, therefore, should be transferred to costing Profit and Loss A'c.

[It must have been observed that in the above discussion of the treatment of discrepancies due to various reasons has been made with regard to the *value* of the discrepancy. In the records like Bin Card and Stores Ledger, the discrepancy detected and approved should be adjusted in terms of quantity in the Bin Card and in terms of quantity and value in stores ledger so that the balance as per records agrees with the physical stock. This is done through preparation of Stores Debit Note (in case of surplus) or Stores Credit Note (in case of deficiency) as the case may be.]

Stock Verification

The Stores Ledger or Bin Card tells the balance of stock that should be present at any time, while physical stock represents the actual stock in hand. So, unless the stocks as per record are verified with the physical stocks by counting/measuring/weighing the physical stocks, proper control on stocks can not be obtained, nor the discrepancy can be detected and treated in cost accounts. Such verification may be done either *continuously* throughout the year in a systematic manner taking different items in rotation, so that each item is verified at least once in a year, *or it can be done periodically* at the end of a particular period, taking all the items at a time. In case of the second alternative (i.e., periodical stock verification) the normal work of the factory has to be kept suspended for the purpose.

The discrepancy detected in verification is usually noted in the Bin Card in the remark column. It may also be noted in documents like *Inventory Tag or Stock verification* sheet. On approval, the discrepancy is finally adjusted in Bin Card and Stores Ledger.

Perpetual Inventory System

"Perpetual Inventory" derives its name from the functions it does i.e., indicating the balance of each item of store in hand at all items. The functions cover the ascertainment of the quantity and value of stock in hand at any time without physical counting of stock and independent valuation thereof and also the verification of physical stock at any frequency desired by the management.

Thus, Perpetual Inventory means *Automatic Inventory*. It comprises of (i) *Bin Card* [for quantitative perpetual inventory] (ii) *Stores ledger* [for quantitative cum valued perpetual inventory] and (iii) *Continuous stock-taking*[1] [for physical perpetual inventory].

> *Note* : [1]Sometimes perpetual inventory and continuous stock taking are taken as the same, but it is not correct.

The following are the *advantages* of Perpetual Inventory System :

(a) A complete and reliable check is obtained on the stores.

(b) The normal work of the factory need not be kept suspended for the purpose of stock-taking.

(c) Preparation of Profit & Loss A/c and Balance Sheet under financial accounting system need not be delayed for stock figures, because they are available from cost records.

(d) Discrepancies can be readily detected and adjusted. Measures to avoid such discrepancies, wherever possible, may be taken.

(e) Stocks can be kept within the limits prescribed, because stores audit extends to this aspect also.

(f) Since the stocks are kept within the limits, there are no chances of capital being unnecessarily blocked, bottleneck in supply for production, loss due to deterioration, obsolescence etc.

(g) Replenishment of stock, in time, is assured, because stores audit also looks into the fact whether initiative for purchase was taken as soon as the stock reached the ordering level.

(h) It creates a moral check upon the stores personnel.

(i) Experienced personnel can be employed to work on the system.

(j) For fire insurance etc. reliable stock figures can be obtained.

(k) Systematic review of perpetual inventory helps detection of obsolete and slow-moving materials.

The *disadvantages* of the system are—

(a) It is costly. (b) Unless Bin Cards and Stores Ledgers are kept up-to-date the work shall be hampered. (c) If the Bin Card balance does not agree with the Stores Ledger balance, the two must be reconciled first and then physical verification of stock shall be feasable. This will require time.

Inspite of the disadvantages cited above, the perpetual inventory system is of high importance, because of the various advantages which easily outweigh the minor disadvantages.

INVENTORY TURNOVER

Inventory (or stock) turnover, usually expressed as a ratio, indicates the number of times the inventory is turned over (i.e., bought and consumed) during a particular period. It is a measure of the rate at which materials are consumed. The ratio helps to identify slow-moving, dormant and obsolete stores. The ratio is calculated by using the following formula :

$$\frac{Cost\ of\ material\ consumed\ during\ a\ period}{Average\ inventory\ held\ during\ that\ period}$$

Average inventory is the average values of the opening and closing stock of materials, or if monthly or quarterly stock figures are available the average of these figures taken over the period.

A high inventory turnover indicates a low stock and a low inventory turnover indicates a high stock in relation to usage. A high inventory turnover, therefore, avoids (i) danger of deterioration or obsolescence, (ii) excessive holding costs, e.g., interest on capital, (iii) excessive storage space. A low inventory turnover, on the other hand, means accumulation of obsolete materials, carrying of too much stock etc. There may, however, be good reasons for holding high stocks, namely (i) large forward purchases at cheap prices, (ii) uncertainty of supply, (iii) cost of stock-outs, (iv) high reordering costs.

No general rules for inventory turnover can be laid down ; the desired turnover depends on individual circumstances.

Problems in calculating the ratio may be :

(i) Deciding on how many ratios to calculate. A ratio for each item of materials may involve much work and materials may, therefore, be grouped.

(ii) Fluctuations in stores price may mean that, cost of materials used may include different unit values from those of average stock. Number of units should, therefore, be used instead of values.

(iii) Average can be misleading since it can be calculated in a number of ways.

The inventory turnover ratio is only one of a number of techniques available for inventory control and is probably not as important as techniques for determining the optimum order size and stock level.

Illustration 1.

The following are the particulars relating to two items of stock x and y in a period of one year comprising of 365 days.

	X	Y
	Rs.	Rs.
Stock on 1.1.82	3,000	3,500
Purchase during, 1982	30,000	4.500
Stock on 31.12.82	1,000	2.500

The turnover ratios are worked-out as below :

Materials consumed during 1982	X	Y
	Rs.	Rs.
Opening Stock	3,000	3,500
Add : Purchases	30.000	4,500
	33,000	8,000
Less : Closing Stock	1,000	2.500
	32,000	5,500

	X	Y
	Rs.	Rs.
Average inventory	$\dfrac{(3,000+1,000)}{2}$	$\dfrac{(3,500+2,500)}{2}$
	or 2,000	or 3,000
Turnover ratio	$\dfrac{32,000}{2,000}$	$\dfrac{5,500}{3,000}$
	or 16	or 1·83
No. of days the average inventory is held	$\dfrac{365 \text{ days}}{16}$	$\dfrac{365 \text{ days}}{1\cdot83}$
	or 22·81 days	or 199·45 days.

The above results show that, material x is fast-moving and material y is very slow-moving.

SECTION IV

PRICING THE ISSUE OF MATERIALS

Materials issued against stores requisition are to be priced by the Cost Department before such issues are entered in the stores ledger and charged to job or service. There are different methods of pricing the issues. Let us enumerate the methods for discussion one by one.

1. **Cost Methods**

    (a) Specific Cost Method

    (b) Cost method on the principles of—

        (i) First-in First-out (*FIFO*)

        (ii) Last-in First-out (*LIFO*)

      (iii) Highest-in First-out (*HIFO*)

       (iv) Next-in First-out (*NIFO*)

       (v) Base stock method.

    (c) **Average Cost Methods—**

       (i) Simple average

      (ii) Weighted average

     (iii) Periodic average (simple and weighted)

     (iv) Moving average.

2. **Replacement Price Method or Market Price Method**

3. **Standard Price Method**

4. **Inflated Price Method**

5. **Re-use Price Method**

COST METHODS

1. (a) Specific Cost Method

Under this method, material issued is priced at the exact cost of the said material. Here the identity of material and its corresponding price are to be obtained. When any material is specially purchased for a job and issued to it, this method is suitable. Thus, in job costing where non-standard materials are purchased and stored in separate lots this method can be applied.

Advantages :

    (a) The method gives appropriate materials cost for charging to job or service.

    (b) The method is suitable in job costing where non-standard materials are purchased, kept in separate lots and then issued.

Disadvantages :

    (a) It is difficult to identify the material of a particular purchase and its corresponding cost when the purchases are numerous.

(b) Standard materials purchased in separate lots are not usually kept in separate places for identification. If that is done for proper identification, the cost of storage space shall be higher.

1. (b)(i)   First-in First-out (*FIFO*) Method

Under this method, for the purpose of pricing the issues, it is assumed that materials received first are issued first and charges are made at the corresponding costs. In other words, issues take place in the order of receipts. Here the identity of materials is not required. In fact, the material received last may be issued first (i.e., in case of materials placed in heaps it can not be expected that materials from the bottom shall be issued). In FIFO the earlier purchases shall be exhausted earlier (as per assumption) and the stock will represent later purchases. Thus, in condition of falling prices, higher costs shall be consumed by production and there will be lower replacement cost. The opposite shall happen in the conditions of rising prices.

Advantages :

   (a) Materials shall be charged at cost. So there will be no difference between total cost and total charges.
   (b) In conditions of falling prices the method gives better result.
   (c) Value of closing stock shall more or less correspond to the market price.
   (d) The method is simple in both theory and practice.

Disadvantages :

   (a) In conditions of rising prices the method proves that lower costs are absorbed by production and higher costs are represented by closing stock. Greater working capital shall be required for replacement of stock.
   (b) In case of large number of purchases clerical errors in pricing may come up.
   (c) Two jobs may be charged at different rates (on the basis of stock available). So comparison of cost shall give misleading results.

Illustration 2.

Draw stores ledger account recording the following transactions that took place in January 1983, under the FIFO method :

1st Jan.	Opening stock	200 pieces @ Rs. 2 each
5th Jan.	Purchases	100 pieces @ Rs. 2·20 each
10th Jan.	Purchases	150 pieces @ Rs. 2·40 each
20th Jan.	Purchases	180 pieces @ Rs. 2·50 each
2nd Jan.	Issues	150 pieces
7th Jan.	Issues	100 pieces
12th Jan.	Issues	100 pieces
28th Jan.	Issues	200 pieces

Solution :

STORES LEDGER ACCOUNT

Description of material :
Specification :
Code No.................
Bin No..................... Location :

Folio :
Maximum Level :
Minimum Level :
Ordering Level :

Date	RECEIPTS				ISSUES				BALANCE			Remarks
	G.R.N. No.	Qty. (pieces)	Rate Rs.	Amount Rs.	S.R. No.	Qty. (pieces)	Rate Rs.	Amount Rs.	Qty. (pieces)	Rate Rs.	Amount Rs.	
1983 Jan. 1									200	2·00	400	
,, 2						150	2·00	300	50	2·00	100	
,, 5		100	2·20	220					150{50,100}	2·00 / 2·20	100}320 {100,220}	
,, 7						100{50,50}	2·00 / 2·20	100}210 {100,110}	50	2·20	110	
,, 10		150	2·40	360					200{50,150}	2·20 / 2·40	110}470 {110,360}	
,, 12						100{50,50}	2·20 / 2·40	110}230 {110,120}	100	2·40	240	
,, 20		180	2·50	450					280{100,180}	2·40 / 2·50	240}690 {240,450}	
,, 28						200{100,100}	2·40 / 2·50	240}490 {240,250}	80	2·50	200	

(Stores Ledger under *FIFO* Method)

1. (b)(ii)   Last-in First-out (*LIFO*) Method

This method is similar to *FIFO* with the exception that, here, for the purpose of pricing the issues, it is assumed that latest receipts are issued first. The identity of the material is immaterial. In fact, the earliest purchases may be issued first in some cases and in other cases latest purchases can be conveniently issued first (i.e., in case of liquid material stored in overhead tank and distributed by pipe line it is possible to issue the earliest purchases first. In case of solid materials purchased in lots and placed one upon another, latest purchases can be conveniently issued first). For the purpose of pricing it is always assumed that latest purchases are issued first. However, in conditions of rising prices the charge to production, under this method, shall be more or less at current market price while the stock shall represent earlier low prices.

Advantages :

(a)   Cost of material charged to jobs shall represent more or less the current market prices.

(b)   In conditions of rising prices the method creates high charge to production. So, same volume of materials can be easily bought without requiring additional working capital.

(c)   The closing stock shall represent earlier low prices and hence there will be no unrealised profit in the Profit & Loss A/c under financial accounting.

(d)   The method will give better result where profits fluctuate during periods of changing price levels.

(e)   The method is simple in theory and practice.

(f)   There will be no difference between total cost incurred and total charges made.

Disadvantages :

(a)   In conditions of falling prices the method will mean lower charge to production and higher value of closing stock.

(b)   Clerical errors may crop up in pricing where there is a large number af purchases.

(c)   Two jobs may be charged at different rates (depending on the availability of stock) thereby rendering any comparison of cost unreliable.

(d)   In conditions of rising prices the value of closing stock shall have no influence of the current market conditions on it.

Illustration 3.

On the basis of information given in Illustration 2 draw up a stores ledger account under the *LIFO* method.

Solution :

STORES LEDGER ACCOUNT

Description of material :
Specification :
Code No..................
Bin No.................. Location :

Folio :
Maximum Level :
Minimum Level :
Ordering Level :

Date	RECEIPTS				ISSUES				BALANCE			Remarks
	G.R.N. No.	Qty. (pieces)	Rate Rs.	Amount Rs.	S.R. No.	Qty. (pieces)	Rate Rs.	Amount Rs.	Qty. (pieces)	Rate Rs.	Amount Rs.	
1983 Jan. 1									200	2·00	400	
,, 2						150	2·00	300	50	2·00	100	
,, 5		100	2·20	220					150 { 50 / 100	2·00 / 2·20	100 / 220 } 320	
,, 7						100	2·20	220	50	2·00	100	
,, 10		150	2·40	360					200 { 50 / 150	2·00 / 2·40	100 / 360 } 460	
,, 12						100	2·40	240	100 { 50 / 50	2·00 / 2·40	100 / 120 } 220	
,, 20		180	2·50	450					280 { 50 / 50 / 180	2·00 / 2·40 / 2·50	100 / 120 / 450 } 670	
,, 28						200 { 180 / 20	2·50 / 2·40	450 / 48 } 498	80 { 50 / 30	2·00 / 2·40	100 / 72 } 172	

(Stores Ledger under *LIFO* Method)

FIFO and *LIFO* Methods Compared :

The following are the points of distinction :

(1) In case of *FIFO*, first receipts are first issued, while in case of *LIFO*, latest receipts are first issued.

(2) In conditions of rising prices *FIFO* gives greater profit than *LIFO* due to difference in the values of closing stock. In conditions of falling prices opposite shall be the result.

(3) *FIFO* puts emphasis on the Balance Sheet, while *LIFO* puts emphasis on the Income Statement (i.e., Profit & Loss A/c). So, if somebody desires that inventory should correspond to current cost he should choose *FIFO*. If another desires *matching* of current costs with current revenue he should go in for *LIFO*.

(4) *FIFO* does not match current costs with current revenue, but it show , working capital correctly in the Balance Sheet. *LIFO* on the other hand, matches current costs with current revenue, but shows working capital incorrectly.

Since matching is very essential. *LIFO* may be used and in that case, the current costs of the closing stock may be mentioned by way of footnote to make the working capital position clear.

1. (b)(iii) Highest-in First-Out (*HIFO*)

When it is desired that issues shall be charged at the highest cost of purchase in stock so that closing stock may represent purchases at lower rates, the method may be termed Highest-in First-Out or *HIFO* simply. This method did not gain any importance. Only in monopoly concerns and in case of *Cost plus Costing* the application of the method may be noticed. Since the closing stock represents lower cost, it helps to create secret reserve. Comparison of costs, as in case of *FIFO* or *LIFO*, becomes unreliable under this method.

1. (b)(iv) Next-in First-Out (*NIFO*)

Under this method the issue is charged at the rate of next purchase which is yet to arrive. The object of the method is to see that the charge corresponds to the market price. This is, therefore, similar to *market price* method (discussed later), but is easier in application than that method, as the rate of next purchase can be easily known from the purchase order placed. Complications will arise if the rate of next purchase is changed at the time of making payment, due to any reason whatsoever. The method has not been accepted for general application. Comparison of costs becomes unreliable as in cases of *FIFO*, *LIFO* and *HIFO*.

1. (b)(v) Base Stock Method

Under this method a fixed quantity of materials is always maintained at *original cost* and all issues take place out of stock *in excess* of that fixed quantity either using *FIFO* principle or using *LIFO* principle. The fixed

quantity so maintained at original cost is called *Base Stock*. It is obvious that, if such a situation arises that, unless issue is made out of the base stock the production flow shall be stopped, issue has to be made, otherwise, the purpose of maintaining base stock shall be lost. In this exceptional case, the base stock shall be permanently reduced.

Since we are to use either *FIFO* or *LIFO* principle, Base Stock should not be considered as an independent method. It may be regarded as a separate technique only. Normally *FIFO* is used in Base Stock technique.

Advantages :

   (a) Process industries like refinery, leather industry, non-ferrous metal industry etc. which use basic raw materials may suitably apply this technique.
   (b) In industries where a considerable quantity of basic material is to be kept in process for a long time, this technique is applicable.
   (c) The technique renders the valuation of closing stock easy.
   (d) The technique is simple in theory and practice.
   (e) The mode of valuation of closing stock renders the profit or loss most conservative.

Disadvantages :

   (a) All the disadvantages of *FIFO* or *LIFO*, whichever is used in Base Stock technique, shall apply in this case.
   (b) Base Stock is a part of the stock of materials which is an item of current asset. Why, therefore, base stock should be treated as an item of fixed asset and shown at original cost in the Balance Sheet ?
   (c) Base Stock sometimes appears in the Balance Sheet at most unbelievable price (for example, in an ornament manufacturing company, base stock of gold may still appear at Rs. 15 per tola) and as a result, the partners and shareholders may be cheated at the time of winding up.

Illustration 4.

The following is the record of the receipts and issues of materials in a factory during March, 1983 :

March	1.	Purchased	2,000 units @ Rs. 10
	8.	Issued	600 „
	12.	Purchased	1,000 „ @ Rs. 12
	15.	Issued	1,200 „
	19.	Issued	300 „
	25.	Purchased	1,200 „ @ Rs. 11
	27.	Issued	1,300 „
	30.	Purchased	700 „ @ Rs. 13

Prepare a stores ledger account assuming that a base stock of 300 units @ Rs. 10 per unit is maintained and the *FIFO* method is applied.

Solution :

STORES LEDGER ACCOUNT

Date	RECEIPTS				ISSUES				BALANCE			Remarks
	G.R.N. No.	Qty. (units)	Rate Rs.	Amount Rs.	S.R. No.	Qty. (units)	Rate. Rs.	Amount Rs.	Qty. (units)	Rate Rs.	Amount Rs.	
1983 Mar. 1		2,000	10	20,000					2,000	10	20,000	
,, 8						600	10	6,000	1,400	10	14,000	
,, 12		1,000	12	12,000					2,400 {1,400 / 1,000}	10 / 12	{14,000 / 12,000} 26,000	
,, 15						1,200 {1,100 / 100}	10 / 12	{11,000 / 1,200} 12,200	1,200 {300 / 900}	10 / 12	{3,000 / 10,800} 13,800	
,, 19						300	12	3,600	900 {300 / 600}	10 / 12	{3,000 / 7,200} 10,200	
,, 25		1,200	11	13,200					2,100 {300 / 600 / 1,200}	10 / 12 / 11	{3,000 / 7,200 / 13,200} 23,400	
,, 27						1,300 {600 / 700}	12 / 11	{7,200 / 7,700} 14,900	800 {300 / 500}	10 / 11	{3,000 / 5,500} 8,500	
,, 30		700	13	9,100					1,500 {300 / 500 / 700}	10 / 11 / 13	{3,000 / 5,500 / 9,100} 17,600	

(Stores ledger under Base Stock Method)

AVERAGE COST METHODS

Ic(i) Simple Average Method

Under this method the rates of purchases represented by stock at the time of issue are added and then divided by the number of such rates to obtain the simple average rate at cost. Any new purchase or exhaustion of any existing stock requires the rate to be revised. The quantity of each purchase is ignored for this purpose of ascertaining the average rate.

Any kind of average rate is used to dampen the severity of the effect of rises and falls in the prices of purchase. Thus, average cost is used in case of fluctuating rates of purchase. It is obvious that average cost does not represent cost properly.

Advantages :

(a) It is simple to work out and apply.

(b) Fluctuations in prices of purchase cannot affect the issue price considerably.

(c) When different lots of purchases are mixed up so that identification is not possible, average cost method suits the condition.

Disadvantages :

(a) Total cost incurred usually does not become equal to the total charges. So, profit or loss on material arises.

(b) In case of frequent purchases, frequent calculations of rates shall be necessary involving much clerical work. Even if, no new purchase comes, average rate may have to be revised due to exhaustion of an existing stock.

(c) When lots of purchases vary much in quantities, the method results into too much profit or loss on materials.

(d) Verification of closing stock figures becomes difficult due to disappearance of the identity of materials in store.

(e) The closing stock may show absurd figure. In times of inflationary spiralling, the closing stock account may show even credit balance.

The simple average method can work well where :

(i) there is standard quantity of purchase in each lot.

(ii) there is very mild fluctuation in prices.

Illustration 5.

A manufacturing company purchased and issued a certain material in the following order :

Date 1982	Particulars	Units	Unit Cost Rs.
Jan. 1	Purchases	600	4·00
4	Purchases	300	4·20
6	Issues	500	—
10	Purchases	700	4·40
15	Issues	800	—
20	Purchases	300	5·00
23	Issues	100	—

Prepare a Stores Ledger, pricing the issues at Simple Average Cost.

Cost (Part I)—7

Solution :

Stores Ledger Account

Date	Receipts				Issues				Balance			Re-marks
	G.R.N. No.	Qty. (units)	Rate Rs.	Amount Rs.	S.R. No.	Qty. (units)	Rate Rs.	Amount Rs.	Qty. (units)	Rate Rs.	Amount Rs.	
1982												
Jan. 1		600	4·00	2,400					600		2,400	
,, 4		300	4·20	1,260					900		3,660	
,, 6		—	—			500	4·10	2,050	400		1,610	
,, 10		700	4·40	3,080		—	—	—	1,100		4,690	
,, 15		—	—	—		800	4·20	3,360	300		1,330	
,, 20		300	5·00	1,500		—	—	—	600		2,830	
,, 23		—	—	—		100	4·70	470	500		2,360	

Working Notes :

Calculation of simple average price :

For issue on 6th January $\dfrac{4·00+4·20}{2} = $ Rs. 4·10.

15th $\dfrac{4·00+4·20+4·40}{3} = $ Rs. 4·20

23rd $\dfrac{4·40+5·00}{2} - $ Rs. 4·70

The price of the lot which has been completely exhausted before 23rd, has been excluded for calculating the simple average price as on the 23rd of January.

Periodic simple average method

Periodic simple average is a little deviation from the simple average method. In this case the rates of purchases during a given period are added and then divided by the number of such purchases during that period to obtain the periodic simple average rate. Since the opening stock represents last period's purchase, its value is not considered in the calculation of periodic simple average rate.

As regards the *advantages* of periodic simple average method, it can be generally said that, the advantages of simple average method are applicable in this case also with some extra advantages that— (i) one rate is calculated for application to all issues during the period, avoiding new calculation whenever a new purchase comes (ii) charges during a period are made at uniform rates.

Disadvantages of simple average method are generally applicable in case of periodic simple average method also, with the additional disadvantage that, the entire work of charging the issues has to be kept suspended till the end of the period when it is possible to calculate the periodic simple average rate. (Sometimes the previous period's rate is applied in the current period to remove this difficulty.)

Illustration 6.

On the basis of information given in Illustration 5, prepare a stores ledger account pricing the issues on periodic simple average method.

Solution :

Stores Ledger Account

Date	G.R.N. No.	Qty. (units)	Rates Rs.	Amount Rs.	S.R. No.	Qty. (units)	Rate Rs.	Amount Rs.	Qty. (units)	Rate Rs.	Amount Rs.	Re- marks
			Receipts				Issue			Balance		
1982 Jan. 1		600	4·00	2,400					600		2,400	
,, 4		300	4·20	1,260					900			
,, 6		--	—	—		500			400			
,, 10		700	4·40	3,080		—	—	—	1,100			
,, 15		—	—			800			300			
,, 20		300	5·00	1,500					600			
,, 23		—	—			100			500		2,080	
		1,900		8,240		1,400	4·40	6,160				

Notes :

(1) Periodic simple average price : $\dfrac{4·00+4·20+4·40+5·00}{4}$ = Rs. 4·40

(2) Total price of issues : 1,400 × 4·40 or Rs. 6,160

(3) Value of closing stock : Rs. (8,240 – 6,160) = Rs. 2,080

(4) In calculating periodic average the price of opening stock, if any, should be excluded.

2. (b) Weighted Average Method

Under this method the *total value* (at cost) of materials in stock at the time of issue is divided by the *total quantity* of materials in stock to obtain the weighted average rate. In case of simple average, only the rates were taken into consideration, while in case of weighted average, the rates and corresponding quantities are considered, because the value at cost is obtained by multiplying the quantity by the rate.

If the quantities in stocks on a day are q, q^1, q^2 and q^3 with corresponding rates of purchases p, p^1, p^2 and p^3, the weighted average rate shall be worked out as below :

$$\text{Weighted average rate} = \frac{pq + p^1 q^1 + p^2 q^2 + p^3 q^3}{q + q^1 + q^2 + q^3}.$$

Advantages :

(a) The method effectively smoothens the effect of price fluctuations on issue rates.

(b) Unless a new purchase arrives, the rate continues in its application.

(c) Profit or loss on material arises only if mathematical approximation is made in the calculations of the rates.

(d) Unless purchases are made frequently, the clerical works involved is simple and not too much.

Disadvantages :

(a) In case of frequent purchases the work of calculation of rates becomes considerable.

(b) Charges made to issues do not represent cost price (nor the market price) of the materials actually issued.

(c) The method may create profit or loss on materials unless the rates are calculated correcting upto 4 or 5 places of decimal whenever necessary.

Illustration 7.

Prepare a stores ledger account on the basis of information given in Illustration 5, applying weighted average method.

Solution :

Stores Ledger Account

Date	No.	Receipts Qty. (units)	Receipts Rate Rs.	Receipts Amount Rs.	Issue S.R. No.	Issue Qty. (units)	Issue Rate Rs.	Issue Amount Rs.	Balance Qty. (units)	Balance Rate Rs.	Balance Amount Rs.	Remarks
1982												
Jan. 1		600	4·00	2,400					600	4·0000	2,400·00	
4		300	4·20	1,260					900	4·0667	3,660·00	
6		—	—	-		500	4·0667	2,033·35	400	4·0667	1,626·65	
10		700	4·40	3,080					1,100	4·2788	4,706·65	
15		—	—	—		800	4·2788	3,423·04	300	4·2788	1,283·61	
20		300	5·00	1,500					600	4·6394	2,783·61	
, 23		—	—	-		100	4·6394	463·94	500	4·6394	2,319·67	

Periodic weighted average method

In this case one weighted average rate is calculated for application in respect of all issues during a period, taking into consideration the quantities and corresponding rates of purchases during the same period. Opening stock value is not considered, because it represents last period's purchase. Closing stock of the period is, however, valued at this periodic weighted average rate. Some of the disadvantages of weighted average method, like frequent calculation of rates of issue, charging of issues in the same period at different rates etc. are avoided by this method.

Periodic weighted average method requires the suspension of all work of charging the issues till the end of the period.

With exception to the above the periodic weighted average method enjoys the same advantages and suffers from the same disadvantages of weighted average method.

Illustration 8.

Prepare a stores ledger account on the basis of information given in Illustration 5, applying periodic weighted average method.

Solution :

<center>Stores Ledger Account</center>

Date	G.R.N No.	Receipts Qty. (units)	Rate Rs.	Amount Rs.	S.R. No.	Issue Qty. (units)	Rate Rs.	Amount Rs.	Balance Qty. (units)	Rate Rs.	Amount Rs.	Re-mark
1982												
Jan. 1		600	4·00	2,400					600		2,400	
,, 4		300	4·20	1,260					900			
,, 6						500			400			
,, 10		700	4·40	3,080					1,100			
,, 15						800			300			
,, 20		300	5·00	1,500					600			
,, 23						100			500		2,168	
		1,900		8,240		1,400	4·3368	6,072				

Note : Periodic weighted average price : Rs. $\frac{8,240}{1,900}$ = Rs. 4·3368.

Closing Stock Value = Rs. 8,240 – Rs. 6,072 or Rs. 2,168.

2. (c) Moving Average Method

Under this method the total of the periodic average rates of a *selected number of periods* is divided by the number of such periods to obtain the moving average rate. *The periods selected are including and preceding the period in which the materials to be priced are issued.* The selected periods are known as 'average period'. Let the average period is *five months*. For working out the moving average rate to be applied in respect of issues in August, 1983 the periodic average rates of April, May, June, July and August of 1983 shall be averaged. For rate to apply in respect of issues in September, 1983, the periodic average rates of May, June, July, August and September of 1983 shall be averaged. Thus, the 'average period' moves forward and hence the name *moving average.*

Since there are two types of periodic average, namely, periodic simple average and periodic weigthed average, *there shall be two types of moving average also, namely, moving simple average and moving weighted average.*

Moving average method (simple or weighted) smoothens the effect of price fluctuations on the rates of issue. Excessive high or low price paid for any purchases, for any reason, cannot indefinitely influence the issue rates under any moving average method.

3. Replacement Price (or Market Price) Method

Replacement price is a price at which materials issued can be replenished. Thus, it means the market price, because replenishment can be done by purchase at market price. Charging of issues at replacement price, therefore, requires the ascertainment of replacement price (i.e., market price) whenever an issue takes place. The stock after each issue is valued *at stock value before issue minus the value of the issue at replacement price.*

The method may be supported on the ground that material cost of a job or work order shall represent the current market price. It can be objected to also on the grounds that material cost of jobs does not represent the actual cost of materials ; it is not easy to ascertain the replacement price whenever any issue takes place unless the market is a perfect market publishing the price daily ; the value of closing stock, in the conditions of rising prices, may sometimes show negative figure (i.e., Stock A/c showing credit balance) which is absurd.

[Example of application : In ornaments factory the value of gold to be charged to customers is ascertained according to the gold price published in daily news paper.]

4. Standard Price Method

Under this method all factors that may affect price are considered and standard material price for the materials is generally fixed before the actual purchase. Materials issues are valued at that standard price. The factors usually considered for establishing standard price are

(a) Apprehended change in price due to possible change in market conditions.

(b) Amount of discount that may be available from the suppliers depending upon the quantity to be ordered.

(c) Expenses relating to purchase i.e., freights and carriage, customs duty, godown expenses, packing, handling etc.

If there is any difference between the standard price and the actual price of purchase, the difference is called *material variance.* When the variance is due to difference between standard rate of purchase and the actual rate of purchase, such variance is called *rate variance.* If the variance is due to difference between total actual material cost and total standard material cost, there being no difference in rates, the variance is called *usage variance.* Variance may be worked out either at the time of actual purchase or at the end of accounting period. The variance is analysed into causative reasons and its recurrence is prevented by suitable measures.

Advantages :

   (a) Efficiency of the purchase department can be revealed.
   (b) The method is easy to apply, because all issues are charged at standard price.
   (c) The method can be used in any industry, even if standard costing method is not applied there.
   (d) The method helps to exercise control on material cost by setting the standard price, which may be called *the price that should be.*

Disadvantages :

   (a) The issues are not charged at actual cost.
   (b) There may be profit or loss on materials.

(c) A very low or high standard price may spoil the purpose for which it is set.

(d) Since price depends upon a number of unknown variable factors it is difficult to fix a reliable standard price.

Illustration 9.

The purchases and issues of materials X in the month of January, 1982 is as follows :

Jan.	4	Purchase	800 units @ Rs. 20 per unit	
,,	8	Purchase	700 units @ Rs. 18 per unit	
,,	9	Issue	600 units	
,,	11	Issue	800 units	
,,	17	Purchase	800 units @ Rs. 20 per unit	
,,	25	Purchase	500 units @ Rs. 25 per unit	
,,	31	Issue	1,000 units	

The standard price per unit of material is fixed at Rs. 20 for the year, 1982. Show the Stores Ledger entries and determine the price variance for the month of January, 1982. *(I. C. W. A.—Inter.)*

Solution :

Stores Ledger Account

Date	Receipts G.R.N. No.	Qty. (units)	Rate Rs.	Amount Rs.	Issue S.R. No.	Qty. (units)	Rate Rs.	Amount Rs.	Balance Qty. (units)	Rate Rs.	Amount Rs.	Remark:
1982												
Jan. 3		800	20	16,000					800		16,000	
,, 8		700	18	12,600					1,500		28,600	
,, 9						600	20	12,000	900		16,600	
,, 11						800	20	16,000	100		600	
,, 17		800	20	16,000					900		16,600	
,, 25		500	25	12,500					1,400		29,100	
,, 31						1,000	20	20,000	400		9,100	

Value of closing stock at standard price 400 units @ Rs. 20	Rs. 8,000
,, ,, ,, ,, ,, actual cost as per Stores Ledger	Rs. 9,100
Material price variance (unfavourable)	Rs. 1,100

5. Inflated Price Method

Normally, under any method, cost of material is considered to be the invoice price plus freight, insurance, carriage etc. less discount (i.e., trade discount). Under inflated price method, in addition to the above, the cost is considered to be including the costs of placing orders, receiving, inspecting, storing and handling of materials as well. Issues are charged on the basis of this cost. In other words, the issue price of materials is inflated by including *all cost incurred for materials till they are issued for production ; the costs being the invoice price (less trade discount) plus freight and insurance plus carriage plus cost of placing orders plus cost of receiving, inspecting, storing, handling etc.*

Thus, where items like costs of placing orders, cost of receiving, inspecting, storing, handling etc. are treated as elements of *works overhead* under any method of charging the issues, they are treated as part of *Direct material cost* under inflated price method of charging the issues.

6. Re-use Price Method

When any *rejected material* is used for any purpose other than the purpose for which it was acquired, the price charged to that purpose in respect of the rejected material issued to it, shall normally be lower than the cost of original material, but there should be some relationship between the purchase price of the material for that purpose and the price charged. Let a metal box factory prepares aluminium boxes out of standard aluminium sheets. The small scraps are re-used for toy-making. The price charged to toy-making in respect of the aluminium scraps shall be less than the price of proportionate aluminium sheet, but there should be some relationship between the price charged and the price of proportionate aluminium sheet, otherwise toy-making cost on the basis of market price of aluminium cannot be guessed.

Re-use price, therefore, represents the price charged in respect of rejected materials issued to alternative use. This price is less than the cost of original material. This indicates that under re-use price method there shall be profit or loss on materials.

Stock Valuation

We have seen earlier that, the quantity and value of any item of material, as at a particular time, are shown by the Stores Ledger and the quantity only is shown by the Bin Card. We have also learnt that under perpetual inventory system the physical stock is systematically verified with the stock as per records. The value of the materials appearing in the Stores Ledger depends upon the method of pricing the issues. This value may or may not be accepted for the purpose of Trading A/c and Balance Sheet under financial accounting system. If it is not accepted for any reason, the financial accountant has to value all the items of materials in stock as on the date of account closing. He is not required to take stock, because the quantity shown by Bin Card is verified with the physical quantity under the Cost Accounting System.

The traditional basis of stock valuation is the 'Cost or market price whichever is less'. This basis is also subject to further clarification. Which cost is to be considered ? Cost may be on the basis of FIFO, LIFO or Average. Which one is to be accepted ? Similarly, market price may refer to *replacement price* (i.e., price required to replenish similar quantity of stock of the same type) or *realisable price* (i.e., price that can be obtained if the stock is sold). Which one is to be accepted ?

It has been mentioned already that, in the presence of a reliable costing system which systematically and regularly verifies the physical stock

with the stocks as per records, it is not necessary for the financial accountant (or the management in general) to count/measure/weigh each item of materials and then value them at cost or market price whichever is less. He can get the quantity from cost records and value it. In the absence of a costing system and also where perpetual inventory system with systematic and regular stock verification is absent, it is essential to count, measure/ weigh each item of stock, record the quantities so obtained on the Stock Sheet and put value against each item. Thus, the work of stock valuation includes—(a) counting/measuring/weighing of stock (if necessary), (b) ascertaining the cost and market price and (c) selecting the lower value (cost or market price) and (d) putting the value of stock at the rate selected under 'c' above.

While putting the values, *two alternative methods* may be followed as stated below :

(i) Put the value of each item of stock (either individually or in groups) in two columns—in one column at cost and in the other column at market price. The value in the column showing lower *grand total* is accepted. The group totals may also be considered (instead of grand totals) for selecting the lower value. Let there are four groups of items. If the totals of the first group show that cost column is less than the market price column, the value in the cost column shall be accepted. If t e totals of the second group show that market price column is less than the cost column, the value in the market price column shall be accepted and so on. This method is called the *Global or Aggregative method*.

(ii) Put the value of each item of materials at the lower rate (cost or market price) and then take the total of such values to get the stock value. This method is called *pick and choose method*.

In case of global or aggregative method either the *group totals* at cost price and at market price or *grand totals* at cost price and at market price are compared for accepting the lower value ; while in case of pick and choose method the cost price and market price of each item are compared for accepting the lower value.

Let us examine the effect of valuation at cost or market price whichever is less.

In conditions of *general rise in price*, the market price of all the items shall be higher than cost. So, inventory shall be definitely valued at cost whether the global method or the pick and choose method is adopted. In the conditions of *selective rise in price* the market prices of some items may be higher than the corresponding cost prices, while those of other items may be equal to or less than their cost prices. In this case, where global method is applied we get the aggregate value of stock, because the lower group total (or grand total) column may include some prices which are<cost and also some prices which are>cost. In the same case as above, where pick and choose method is applied, the list of all values shows

the lower of cost or market price against each item. Let us take an example of selective rise in prices. Let in a group there are five items a, b, c, d and e. Price of a, b and e are on the rise, that of c is static and that of d is on the fall. The cost rates of a, b, c, d and e are respective'y Rs. 200, Rs. 250, Rs. 150, Rs, 175 and Rs. 100. The market rates are Rs. 225, Rs. 260, Rs. 150, Rs. 160, and Rs. 120 respectively. The stock quantities of a, b, c, d and e are as below :

a— 100 units, b—200 units, c—150 units, d—300 units and e—400 units.

Valuation under global or aggregate method :

Group.. ..Items	Quantities	at Cost Price Rs.	at Market Price Rs.
a	100	20,000	22,500
b	200	50,000	52,000
c	150	22,500	22,500
d	300	52,500	48,000
e	400	40,000	48,000
	Stock value	1,85,000	× 1,93,000

Group total in the cost column is less than that in the market price column and hence this value is accepted although it includes the higher price of item 'd'. So, stock value does not represent lower value of each item under global method.

Valuation under pick and choose method

Item	Quantities	Cost rate Rs.	Market rate Rs.	Value Rs.	Accepted @
a	100	200	225	20,000	200
b	200	250	260	50,000	250
c	150	150	150	22,500	150
d	300	175	160	48,000	160
e	400	100	120	40,000	100
			Stock value	1,80,500	

Stock value represents lower value of each item.

In conditions of *general fall in market prices*, the stock shall be valued at market price. In case of *selective fall in market prices*, the stock value under global method may not represent the lower value of each item, but under pick and choose method the stock value must represent the lower value of each item.

When the cost price (of each item as in case of pick and choose method or as shown in cost price column under global method) is less than the market price, the stock value is taken at cost and it appears in the Balance Sheet as such. When the cost price is higher than the market price, the stock value is ascertained at market price. The excess of the stock value at cost over its corresponding value at market price represents loss. What is done usually is that, such loss is debited to 'Loss on Valuation A/c' and credited to 'Provision against Stock A/c'. The loss is written off, the stock is shown in the Balance Sheet *at cost price* and *the provision is shown as deduction·therefrom.*

SECTION V

ACCOUNTING FOR MATERIAL

After the materials are issued against stores requisitions, it is essential to analyse, at periodical ends, the materials issued in connection with various jobs or standing order numbers, so that direct materials issued to jobs during the period can be charged to the respective job accounts and indirect materials issued during the period can be charged to factory overhead account. This analysis is done through a record called *material analysis sheet or material abstract.*

Material analysis sheet

Material analysis sheet is a record used for the purpose of analysing the cost of materials issued during a period by jobs and standing order numbers. Usually weekly analysis is done. This record, at a glance, shows the cost of direct materials consumed by each job or work order during the period and also the cost of indirect materials chargeable to factory overhead account. When the analysis sheet is prepared it is essential to see that the entire cost of direct and indirect materials issued during the period is covered. A simple specimen of a material analysis sheet is given below :

LINDWAL LTD.
Material Analysis Sheet

Week ending on...........

Date	Requisition No.	Total Amount Rs.	JOBS				PROCESS			Production overhead
			73 Rs.	74 Rs.	75 Rs.	76 Rs.	1 Rs.	2 Rs.	3 Rs.	Rs.
Total										

[*Note* : The total column at the bottom indicates the cost of materials consumed by different jobs and process during the week and also value of indirect materials chargeable to factory or production overhead.]

Before discussing the accounting entries the various treatments of scraps, spoilage, wastage etc. must be clearly understood, because entries shall depend upon the treatment desirable. It is worth-mentioning here that, some quantity of scraps, spoilage etc., is inevitable in any industry.

Scraps

Scraps may occur due to break down of machinery, wrong planning, bad production method, inferior material, bad workmanship etc. According to ICMA (London) *scrap* refers to discarded materials (from any job or process) having some value which is either sold without further treatment or used as raw material for another process. Although scraps possess value, it is often difficult to ascertain the value before the actual sale. The following are the various alternative treatments of scraps in Cost Accounts.

(a) Ascertain the value of scraps and credit it to the job from which scraps occurred.

(b) Credit the sale proceeds of scraps from all jobs to production or factory overhead account.

(c) Credit the sale proceeds of scraps to miscellaneous income account (in this case it does not come into cost accounts).

(d) Debit the value to job using the scraps as raw materials and credit the job from which these originated.

If the value of the scraps can be ascertained and identified with the job from which they occurred, the first of the above treatments is the best. In this case the relevant accounting entries are as below :

(i) Scraps Materials A c......Dr.......
    To Work-in-Progress A/c

Value of scraps credited to job from where they originated.

(ii) Bank/Debtors A/c   Dr.......
    To Scraps Materials A/c
    (Scraps sold)

If identification of the scraps with the job is difficult, treatment (b) above is suitable. In this case entry is passed after sale of scraps owing to difficulty in valuation. The relevant entry is as below :

(i) Bank/Debtors A/c   Dr.......
    To Factory Overhead A/c
    (Sale proceeds of scraps credited to factory overhead)

When the scraps are insignificant, the sale proceeds as indicated in (c) above are credited to Miscellaneous Income A/c which is transferred to Profit & Loss A/c. The relevant entries are as below :

(i) Bank/Debtors A/c   Dr.......
    To Miscellaneous Income A/c
    (Sale proceeds of scraps treated as Miscellaneous Income)

(ii) Miscellaneous Income A/c   Dr.......
    To Profit & Loss A/c
    (Transfer to Profit & Loss A/c)

When scraps from one job is treated as raw materials for another job, treatment (d) above is done. The relevant entry is as below :

Work-in-Progress (job using the scraps) A/c   Dr.......
    To Work-in-Progress (job giving out the scraps) A/c
    (Transfer of scrap to other job as raw material)

Spoilage

Spoilage, according to ICMA (London), refers to units of output which fail to reach the required standard of quality or specification. Thus, these sub-standard units can be corrected and brought to standard at some additional cost. When it is considered *not economic* to rectify the sub-standard or faulty units, they are sold as sub-standard articles or as *seconds*. When the additional cost of rectification is less than the loss in value if the fault is allowed to remain uncorrected, correction is done.

Accounting treatment of spoilage

(1) Loss arising out of spoilage may be charged to the production order on which spoilage occurred.

Or

(2) Loss arising out of spoilage may be charged to production overhead and then spread over all the production orders.

If the spoilage can be identified with any particular production order, the first of the above two treatments should be done.

If, however, spoilage is of general nature and can not be identified with any production order, the second treatment should be done.

When the spoilage is charged to production orders, the accounting entries shall be as below—

    (a) Work-in-Progress A/c   Dr.
             To Materials Control A/c
             ,, Wages Control A/c
             ,, Production Overhead Control A/c
             (*elements charged to jobs*)

    (b) Spoiled Goods Stock A/c   Dr.
             To Work-in-Progress A/c
             (*sale value of spoiled goods credited to jobs*)

When the spoilage is treated as production overhead, the accounting entries shall be as below :

    (a) Work-in-Progress A/c   Dr.
             To Materials Control A/c
              ,, Wages Control A/c
              ,, Production Overhead Control A/c
             (*elements charged to jobs*)

    (b) Spoiled Goods Stock A/c   Dr. (sale value of spoiled goods)
        Manufacturing Overhead Control A/c Dr. (loss due to spoilage)
             To Work-in-Progress A/c

[*Note* : Sometimes spoilage refers to such sub-standard units which can not be sold as seconds even. In this case, such spoiled goods are sold as scraps.]

Defectives

Defective goods refer to materials which develop some imperfection in course of manufacturing process. At some additional labour and material

costs these can be made into perfect finished goods. Thus, defectives are the same as spoilage which are economically capable of being corrected into perfect finished goods.

Defectives are treated in the same way as the spoilage corrected i.e., the cost of rectification is charged to the job from where defectives occurred or it is charged to production overhead which is then spread over all jobs.

Wastes

Wastes refer to that portion of the basic raw materials which is lost in processing. *It has no recovery value.* Wastes may be normal or abnormal. Normal waste is a part of cost, while abnormal waste is excluded from cost and is charged to Costing Profit & Loss A/c. Normal waste arises from causes beyond control, while abnormal waste arises from controllable causes like negligence, inefficiency etc.

General accounting entries for materials

    (a) *For the value of materials chargeable to jobs—*
        Work-in-Progress A/c   Dr.
             To Materials Control A/c

    (b) *For scraps identified with any job—*
        (i) Scrap Materials A/c   Dr.
             To Work-in-Progress A/c
            (value of scraps credited to job)
        (ii) Bank 'Debtors A/c   Dr.
             To Scrap Materials A/c
        (sale proceeds of scrap materials)

    (c) *For sale value of scraps of general nature—*
        Bank/Debtors A/c   Dr.
             To Factory Overhead A/c
        (sale proceeds of scraps credited to production overhead)

    (d) *For the value of scraps which are insignificant—*
        (i) Bank/Debtors A/c   Dr.
             To Miscellaneous Income A/c
        (sales proceeds of scraps credited to miscellaneous income)
        (ii) Miscellaneous Income A/c   Dr.
             To Profit & Loss A/c
        (Balance transferred to Profit & Loss A/c)

    (e) *For the sale value of spoilage identifiable with any job—*
        Spoiled Goods Stock A/c   Dr.
             To Work-in-Progress A/c

    (f) *For the sale value of spoilage of general nature—*
        Spoiled Goods Stock A/c (sale value)   Dr.
        Factory Overhead Control A/c (loss due to spoilage)   Dr
            To Work-in-Progress A/c

(g) *For value of additional materials and wages required for correcting defectives identifiable with any job—*

Work-in-Progress A/c   Dr.

    To Materials Control A/c

    „ Wages Control A/c

(h) *For value of additional materials and wages required for correcting defectives not identifiable with any job—*

Factory Overhead Control A/c   D.˙.

    To Materials Control A/c

    „ Wages Control A/c

WORKED-OUT PROBLEMS

Problem 1.

Shown below are the consumption figures forecast for BR Limited in respect of material 562. You are required to calculate the estimated average stock level for the year.

Forecast Consumption

Material 562   *Re-order Quantity : 8,000 uni*

Month	Consumption (units)	Month	Consumption (units)
January	2,000	July	3,000
February	2,000	August	3,000
March	2,800	September	2,200
April	2,800	October	2,200
May	3,000	November	2,000
June	3,000	December	2,000

Delivery period from suppliers : *minimum   2 months*

                                           maximum   4 months

Solution ·

Re-order level = Maximum usage × Maximum delivery period

           = 3,000 × 4 = 12,000 units

Maximum level = Re-order level + Re-order quantity

               − (Minimum usage × Minimum delivery period)

           = 12,000 + 8,000 − (2,000 × 2)

           = 16,000 units

Minimum level = Re-order level − (Normal usage[1]

               × Average delivery period)

           = 12,000 − (2,500 × 3)

           = 4,500 units.

Average stock level = ½ (Maximum level + Minimum level)

          - ½(16,000 + 4,500)

          = 10,250 units

Note : 'Normal usage is taken to be the average usage

$$\left(\text{i.e.} \ \frac{\text{minimum usage} + \text{maximum usage}}{2} \right) \text{ for the year,}$$

i.e. $\frac{2,000 + 3,000}{2}$ or,   2,500 units.

Problem 2.

In manufacturing its products, a company uses three raw materials, *A* *B* and *C*, in respect of which the following particulars are available :

Raw material	Usage per unit of product kg.	Re-order quantity kg.	Price per kg. Rs.	Delivery period in weeks Min.	Av.	Max.	Re-order level kg.	Minimum level kg.
A	10	10,000	10	1	2	3	8,000	
B	4	5,000	30	3	4	5	4,750	
C	6	10,000	15	2	3	4		2,000

Weekly production varies from 175 to 225 units, average being 200 units. What would you expect the quantities of the following to be ?

   (i)   minimum stock of A ;   (ii)   maximum stock of B ;

   (iii)   re-order level of C :   (iv)   average stock level of A.

Solution :

Minimum stock of A = Re-order level

              ---(Normal usage × Normal delivery period)

           = 8,000 · (2,000[1] × 2) = 4,000 kg.

Maximum stock of B = Re-order level + Re-order quantity

              ---(Minimum usage × Minimum delivery period)

           = 4,750 + 5,000 – (700[2] × 3) = 7,650 kg.

Re-order level of C = (Maximum usage × Maximum delivery period)

           = 1,350[3] × 4 = 5,400 kg.

Average stock level of A = ½ (Minimum level + Maximum level)

           = ½(4,000 + 16,250[4]) = 10,125 kg.

Notes :   Normal usage of A = Average weekly production × usage per unit of product i.e. 200 × 10 or 2,000 kg.

    'Minimum usage of B = Minimum weekly production × usage per unit of product, i.e. 175 × 4 = 700 kg.

    ²Maximum usage of C = Maximum weekly production × usage per unit of product, i.e. 225 × 6 = 1,350.

    Maximum level of A = 8,000 + 10,000 – {(175 × 10) × 1} = 16,250 kg.

Problem 3.

A manufacturing company produces a special product 'Sorbina' the monthly demand for which is 500 units. The following particulars are available in respect of the material used for manufacturing the product :

    Cost of placing an order Rs. 120.

    Annual carrying cost per unit Rs. 12.

Normal usage 60 units per week.

Minimum usage 30 units per week.

Maximum usage 90 units per week.

Delivery period 4 to 6 weeks.

Compute from the above

    (a) Re-order quantity,   (b) Re-order level,   (c) Minimum level, (d) Maximum level, (e) Average stock level.

Solution :

    (a) *Re-order quantity* $= \sqrt{\dfrac{2C_a O}{C_o}}$ where C_a = consumption p.a.

                                           O = order cost of placing one order

                  $\sqrt{\dfrac{2 \times 3{,}120 \times \text{Rs. } 120}{\text{Rs. } 12}}$ C_o = carrying cost of one unit for one year

           = 250 units (approx.)

Note : C_a = Annual consumption of material for producing 500 · 12 or 6,000 units of Sorbina = 52 weeks × Normal usage of material per week = 52 × 60 = 3,120 units.

    (b) *Re-order level* = (Maximum usage × Maximum delivery period)

                   = 90 × 6 = 540 units

    (c) *Minimum level* = Re-order level − (Normal usage × Normal delivery period)

                   = 540 − (60 × 5) = 240 units

Note : Normal delivery period is taken to be the average delivery period,

           i.e., $\dfrac{4+6}{2}$ or, 5 weeks.

    (d) *Maximum level* = Re-order level + Re-order quantity

                   − (Minimum usage × Minimum delivery period)

                   = 540 + 250 − (30 × 4) = 670 units

    (e) *Average stock level* = $\frac{1}{2}$ (Minimum level + Maximum level)

                   = $\frac{1}{2}$(240 + 670) = 455 units

Problem 4

    A manufacturer buys certain equipment from outside suppliers @ Rs. 30 per unit. Annual needs are 800 units. The following further data are available :

    Annual return on investment 10%

    Rent, insurance, taxes etc. per unit per annum Re. 1

    Cost of placing an order Rs. 100.

    Determine the economic order quantity.

Cost (Part I)—8

Solution :

$$EOQ \cdot \sqrt{\frac{2C_0 O}{C_e}}$$

where $C_0 = 800$ units
$O = $ Rs. 100 per order
$C_e = 10\%$ of Rs. $30 +$ Re. 1
(because carrying cost includes rent,
insurance, taxes etc.) $=$ Rs. 4

$$\sqrt{2 \times 800 \times 100}$$

$= 200$ units.

Problem 5.

From the following praticulars relating to inventory find out : (a) how much should be ordered each time, (b) when should the order be placed, (c) what should be the ideal inventory level immediately before the delivery of material ordered is received.

Actual consumption—12,000 units (in 360 days).
Cost per unit—Re. 1.
Ordering cost—Rs. 12 per order.
Inventory carrying charge—20%.
Normal lead time—15 days.
Safety stock—30 days consumption.

Solution :

(a) $EOQ = \sqrt{\dfrac{2C_0 O}{C_c}}$

where $C_0 = 12,000$ units
$O = $ Rs. 12 per order
$C_e = 20\%$ of Re. $1 = $ Re. 0·20.

$$= \sqrt{\frac{2 \times 12,000 \times 12}{0 \cdot 20}}$$

$= 1,200$ units.

Hence, each time 1,200 units should be ordered.

(b) Re-ordering level $=$ Safety stock $+$ Lead time consumption

$= (30 + 15)$ or 45 days' consumption

$= 45 \times \dfrac{12,000}{360} \cdot 1,500$ units.

Hence, when the stock level reaches 1,500 units an order should be placed.

(c) The ideal inventory level, immediately before the delivery of material ordered is received, is the safety stock level (which represents 30 days' consumption),

i.e., $30 \times \dfrac{12,000}{360}$ or 1,000 units.

Problem 6.

The Ganges Pump Company uses about 75,000 valves per year and the usage is fairly constant at 6,250 per month.

When bought in quantities, the valves cost Rs. 1·50 per unit and the carrying cost is estimated at 20% of average inventory investment on the annual basis. The cost to place an order and process the delivery is Rs. 18.

It takes 45 days to receive delivery from the date of an order and a safety stock of 3,250 valves is desired.

You are required to determine :

(a) the most economic order quantity and frequency of orders in a year ; (b) the order point ; and (c) the most economic order quantity, if the valves cost Rs. 4·50 each instead of Rs. 1·50 each.

Solution :

(a) $$EOQ = \sqrt{\frac{2C_oO}{C_o}}$$

where C_o = Consumption per annum in units ;

O = Ordering cost per order ;

C_o = Carrying cost of one unit of stock for one year.

Thus, $$EOQ = \sqrt{\frac{2 \times 75,000 \times 18}{20\% \times 1·50}}$$

= 3,000 units

Frequency of orders = $\frac{75,000}{3,000}$ or 25 orders per year.

(b) Order point = Safety Stock + (Lead time × Average consumption)

= 3,250 + (1·5 months × 6,250 units p.m.)

= 3,250 + 9,375 = 12,625 units.

(c) EOQ, when cost per valve is Rs. 4·50

$$EOQ = \sqrt{\frac{2 \times 75,000 \times 18}{20\% \times 4·50}} = 1,732 \text{ units (approx.).}$$

Problem 7.

Suman Ltd. buys in lots of 500 boxes which is a 3 month supply. The cost per box is Rs. 125 and the ordering cost is Rs. 150. The inventory carrying cost is estimated at 20% of unit value. (i) What is the total annual cost of the existing inventory policy ? (ii) How much money could be saved by employing the economic order quantity ?

Solution :

	Rs.
(i) *Total annual cost of existing inventory policy*	
Ordering cost : 4 orders per year at Rs. 150	600·00
Carrying cost of average inventory	
(i.e., $\frac{500}{2}$ or 250 boxes) :	
250 × Rs. 125 × 20%	6,250·00
Total annual cost	6,850·00

(ii) *Saving in annual cost if EOQ is adopted* :

$$EOQ = \sqrt{\frac{2C_oO}{C_e}} \qquad = \sqrt{\frac{2 \times 2,000 \times 150}{20\% \text{ of } 125}} \qquad = 155 \text{ units (approx.)}$$

	Rs.
Ordering cost : 2,000 ÷ 155 or 13 orders at Rs. 150	1,950·00
Carrying cost of average inventory :	
$\frac{155}{2} \times$ Rs. $125 \times \frac{20}{100}$	1,937·50
Total annual cost	3,887·50

∴ Saving in annual cost = Rs. (6,850·00 − 3,887·50)

$$= \text{Rs. } 2,962·50$$

Problem 8.

The annual requirement of an item is 12,000 units, each costing Rs. 6. Every order costs Rs. 200 at release and inventory carrying charges are 20% of the average inventory per annum.

Find out : (i) economic order quantity and corresponding total inventory cost (including item costs), (ii) whether the item should be purchased in lots of 6,000 units at a time, if the price per unit is reduced by 5% for this quantity.

Solution :

(i) $EOQ = \sqrt{\dfrac{2C_oC}{C_e}} = \sqrt{\dfrac{2 \times 12,000 \times 200}{20\% \text{ of } 6}} = 2,000 \text{ units}$

Total inventory Cost :	Rs.
Ordering cost : 6 orders[1] per year at Rs. 200 per order	1,200
Carrying cost of average inventory :	
$\frac{2,000}{2} \times$ Rs. $6 \times \frac{20}{100}$	1,200
Item costs : 12,000 at Rs. 6	72,000
	74,400

Note : $\frac{12,000}{2,000}$ or 6 orders are to be placed in a year to meet the annual requirements of 12,000 units.

(ii) *Total inventory cost when 6,000 units are purchased at a time* :

	Rs.
Ordering cost : 2 orders[1] per year at Rs. 200 per order	400
Carrying cost of average inventory :	
$\frac{6,000}{2} \times$ Rs. $5·70^{2} \times \frac{20}{100}$	3,420
Item cost : 12,000 at Rs. 5·70	68,400
	72,220

Notes : [1]$\frac{12,000}{6,000}$ or 2 orders are to be placed in a year to meet the annual requirements of 12,000 units.

[2]Cost per unit is Rs. 6 less 5% or Rs. 5·70.

There will be a saving of Rs. (74,400 – 72,220) or Rs. 2,180, if 6,000 units are purchased at a time.

Problem 9.

Your factory buys and uses a component for production at Rs. 10 per piece. Annual requirement is 2,000 pieces. Carrying cost of inventory is 10% per annum and ordering cost is Rs. 40 per order. The Purchase Manager agrees that as the ordering cost is very high, it is advantageous to place a single order for the entire annual requirement. He also says that, if we order 2,000 pieces at a time, we can get a 3% discount from the supplier.

Evaluate this proposal and make your recommendation.

Solution :

$$EOQ = \sqrt{\frac{2C_oO}{C_c}} = \sqrt{\frac{2 \times 2,000 \times 40}{10\% \text{ of } 10}} = 400 \text{ units}$$

In order to meet the annual requirements of 2,000 units, 5 orders (i.e., 2,000 ÷ 400) are to be placed per year.

	Rs.
Ordering cost : 5 orders per year at Rs. 40 per order	200
Carrying cost of average inventory :	
$\frac{400}{2} \times \text{Rs. } 10 \times \frac{10}{100}$	200
Total Annual cost	400

If 2,000 units are ordered at a time, a discount of 3% is allowed by the supplier. The price per unit, in that case, is Rs. 10 less 3% or Rs. 9·70 and the total amount of discount is $\frac{3}{100} \times \text{Rs. } 10 \times 2,000$ or Rs. 600.

	Rs.
Ordering cost : 1 order per year at Rs. 40	40
Carrying cost of average inventory :	
$\frac{2,000}{2} \times \text{Rs. } 9·70 \times \frac{10}{100}$	970
Total Annual Cost	1,010
Less : Annual cost when *EOQ* is applied	400
Increase in annual cost	610

The proposal is not acceptable. The increase in total annual cost (Rs. 610) is more than the saving in the item cost of Rs. 600 (i.e., 2,000 × Rs. 10 – 2,000 × Rs. 9·70) on account of discounts. The proposal may be considered only when the discount is more than Rs. 610 or above 3·05%.

Problem 10.

A company plans to consume, for a particular production, 760 pieces of a particular component. Past records indicate that purchasing department spent Rs. 12,555 for placing 15,500 purchase orders. The average inventory was valued at Rs. 45,000 and the total storage cost was Rs. 7,650

which included wages, rent, taxes, insurance etc., relating to stores depart-
ment. The company borrows capital at the rate of interest of 10% a year.
Fill in the following table, if the price of a component is Rs. 12.

Lot size	10
Purchase price/year	
Purchase expense/year	
Storage expense/year	
Interest cost/year	
Total cost/year	

Solution :

$$\text{Ordering cost} = \frac{\text{Rs. } 12,555}{15,500} = \text{Re. } 0.81 \text{ per purchase order}$$

$$\text{Storage cost} = \frac{7,650}{45,000} \times 100 = 17\%$$

<div align="center">TABLE</div>

Lot size (10)	Rs.
Purchase price/year : 760 pieces @ Rs. 12	9,120.00
Purchase expense (i.e., ordering cost)/year :	
760 ÷ 10 or 76 orders @ Re. 0.81	61.56
Storage expense/year : $\frac{10}{2} \times$ Rs. $12 \times \frac{17}{100}$	10.20
Interest cost/year : $\frac{10}{2} \times$ Rs. $12 \times \frac{10}{100}$	6.00
Total cost/year	9,197.76

Problem 11.

Arunlal commences the manufacture of model railway engines on 1st
January, 1987. His trading account for the first year is as follows :

	Units	Rs.	Rs.
Sales	1,00,000		10,00,000
Cost of sales :			
Raw materials :			
Opening stock		—	
Purchases		10,00,000	
		10,00,000	
Less : Closing stock		(1,00,000)	
		9,00,000	
Labour		3,20,000	
Production overhead		1,60,000	
Cost of production	1,60,000	13,80,000	
Less : Closing stock	(60,000)	(4,80,000)	
	1,00,000		(9,00,000)
Gross Profit			1,00,000

(1) Stocks of both raw materials and finished goods have increased
uniformly over the year.

(2) The raw materials content of finished goods is Rs. 5 per unit.

(3) Arunlal was ill during August, 1987 when he received orders for
12,000 units which were held up by stock shortage and were subsequently
cancelled. He had further orders for 8,000 units on his books at the year end.

(a) Calculate the following ratios :

(i) Inventory turnover for raw materials.

(ii) Inventory turnover for finished goods.

(iii) Input-output ratio for raw materials.

(iv) Stock-out ratio.

(b) Comment briefly on these four ratios.

Solution :

(a) (i) Inventory turnover for raw materials :

$$= \frac{\text{cost of materials consumed}}{\text{average inventory held}} = \frac{\text{Rs. } 9,00,000}{\frac{1}{2} \times \text{Rs. } 1,00,000} = 18 \text{ (times)}$$

(ii) Inventory turnover for finished goods

$$\frac{\text{cost of sales}}{\text{average inventory held}} = \frac{\text{Rs. } 9,00,000}{\frac{1}{2} \times \text{Rs. } 4,80,000} = 3.75 \text{ (times)}$$

(iii) Input-output ratio for raw materials

$$= \frac{\text{input}}{\text{raw material contents of finished goods}}$$

$$= \frac{\text{Rs. } 9,00,000}{\text{Rs. } 5 \times 1,60,000} = 1.125 : 1$$

(iv) Stock-out ratio

$$= \frac{\text{orders held up by stock shortage}}{\text{orders received}}$$

$$= \frac{12,000}{1,00,000 + 12,000 + 8,000} = 1 : 10$$

(b) *Comments—*

The turnover of raw materials is very rapid (18 times). This means that raw materials are fast-moving and not held up for long before being used in production. In fact, the average inventory is held in stock only for 20 days (i.e., $\frac{365}{18}$) roughly. The turnover of finished goods is rather low (3·75 times) indicating that finished goods are slow-moving. The average inventory of finished goods is held n stock for as long a period as 96 days $\left(\text{i.e., } \frac{365}{3\cdot75}\right)$. The input-output ratio shows an inefficiency in the use of materials. More than 11% of input has been wasted. The stock-out ratio indicates that no efficient system of stock control is exercised by Arunlal.

Problem 12.

The following information regarding receipts and issues of pigments have been obtained from the stores record of a paint manufacturing factory :

1983 April 1 Opening stock of pigments   25,000 kg.

(There were no issues or receipts during the last week of March)

1983 April	2	Issued on Requisition No. 1	13,000 kg.
	,,	2	Issued on Requisition No. 2	2,000 kg.
	,,	3	Received from a supplier by Challan No. 13 of 23-3-83 as per stipulated date of delivery	30,000 kg.
	,,	3	Issued on Requisition No. 3	10,000 kg.
	,,	4	Issued on Requisition No. 4	5,000 kg.
	,.	6	Received from supplier by Challan No. 48	10,000 kg.
	,,	7	Issued on Requisition No. 5	4,500 kg.

Examination by the stock verifier on 6th morning revealed a shortage of 500 kg.

Maximum limit was	50,000 kg.
Minimum limit was	8,000 kg.
Ordering level was	25,000 kg.

You are required to prepare Bin Card No. 36 for the item 'pigment' for which the symbol allotted is x—40, showing therein particulars relating to orders placed and materials reserved, if any.   (*C. A. Inter.—Adapted*)

Solution :

<div align="center">

BIN CARD

</div>

Description : Pigments   Bin No. 36
Symbol : X-40   Maximum level : 50,000 kg.
Stores Ledger Folio :   Minimum level : 8,000 kg.
Unit : Kg.   Ordering level : 25,000 kg.

ORDERED			Date	Receipts		Issues		Balance	Remarks
No. and Date	Qty.	Date Recd.		Challan No.	Qty. (kg.)	Req. No.	Qty. (kg.)	Qty. (kg.)	
15 of 1/4	10,000	6/4	1983 Apr. 1					25,000	
			,, 2			1	13,000	12,000	
			,, 2			2	2,000	10,000	
RESERVED			,, 3	13	30,000			40,000	
			,, 3			3	10,000	30,000	
Job No.	Qty.	Date issued	,. 4			4	5,000	25,000	
—			,, 6				500	24,500	Shortage
			., 6	48	10,000			34,500	
			., 7			5	4,500	30,000	

Problem 13.

Prepare a Stores Ledger under the LIFO method of pricing the issues of stores, using the following information :

1981			*Units*
Jan.	1	Balance in hand @ Rs. 1·10 per unit	100
,,	2	Received @ Rs. 1·20 per unit	200
,,	10	Issued	150

1981			*Units*
Jan.	14	Received @ 1·30 per unit	100
,,	18	Issued	150
,,	23	Returned from the issues on 10th January	20
,,	26	Received @ Rs. 1·20 per unit	100
,,	30	Wastage	10
,,	31	Issued	110

(*C. U., B. Com. Hons.* '81)

Solution :

Stores Ledger Account

Date	RECEIPTS				ISSUES				BALANCE			Remarks
	G.R.N. No.	Qty. (units)	Rate Rs.	Amount Rs.	S.R. No.	Qty. (units)	Rate Rs.	Amount Rs.	Qty. (units)	Rate Rs.	Amount Rs.	
1981 Jan. 1									100	1·10	110	
,, 2		200	1·20	240					300 [100 / 200]	1·10 / 1·20	110 / 240] 350	
,, 10						150	1·20	180	150 [100 / 50]	1·10 / 1·20	110 / 60] 170	
,, 14		100	1·30	130					250 [100 / 50 / 100]	1·10 / 1·20 / 1·30	110 / 60 / 130] 300	
,, 18						150 [100 / 50]	1·30 / 1·20	130 / 60] 190	100	1·10	110	
,, 23		20	1·20	24					120 [100 / 20]	1·10 / 1·20	110 / 24] 134	Returns
,, 26		100	1·20	120					220 [100 / 120]	1·10 / 1·20	110 / 144] 254	
,, 30						10	1·20	12	210 [100 / 110]	1·10 / 1·20	110 / 132] 242	Wastage
,, 31						110	1·20	132	100	1·10	110	

Problem 14.

Draw up a priced Stores Ledger Card from the following particulars, using LIFO method of valuation of issues :

1985, July	1	Opening balance	500 pcs. @ Rs. 2·00
	3	Issue	70 pcs.
	4	,,	10 pcs.
	7	Receipt (from suppliers)	200 pcs. @ Rs. 2·10
	9	Return (from deptt.) from issue dt. 3.7.88	20 pcs.
	10	Shortage found	10 pcs.
	13	Issue	70 pcs.
	14	Receipt (from suppliers)	100 pcs. @ Rs. 2·20
	18	Issue	300 pcs.
	26	Receipt (from suppliers)	50 pcs. @ Rs. 2·00
	30	Issue	60 pcs.

(*C. U., B. Com. Hons.—Adapted*)

Solution :   **Stores Ledger Card**

Date	G.R.N. No.	Qty. Pcs.	Rate Rs.	Amount Rs.	S.R. No.	Qty. Pcs.	Rate Rs.	Amount Rs.	Qty. Pcs.	Rate Rs.	Amount Rs.	Remarks
		RECEIPTS				**ISSUE**				**BALANCE**		
1985 July 1									500	2·00	1,000	
,, 3						70	2·00	140	430	2·00	860	
,, 4						10	2·00	20	420	2·00	840	
,, 7		200	2·10	420					620 ⎰420 ⎱200	2·00 840 ⎰2·10 420 ⎱ 1,260		
,, 9		20	2·00	40					640 ⎰440 ⎱200	2·00 880 ⎰2·10 420 ⎱ 1,300		Retn. from Deptt.
,, 10						10	2·10	21	630 ⎰440 ⎱190	2·00 880 ⎰2·10 399 ⎱ 1,279		Shortage
,, 13						70	2·10	147	560 ⎰440 ⎱120	2·00 880 ⎰2·10 252 ⎱ 1,132		
,, 14		100	2·20	220					660 ⎡440 ⎢120 ⎣100	2·00 880 ⎤ 2·10 252 ⎥ 1,352 2·20 220 ⎦		
,, 18					300 ⎡100 ⎢120 ⎣80	2·20 220 ⎤ 2·10 252 ⎥632 2·00 160 ⎦			360	2·00	720	
,, 26		50	2·00	100					410	2·00	820	
,, 30						60	2·00	120	350	2·00	700	

Note : ·An alternative view is to treat the return as a new purchase (but priced at the original price at which it was issued) and enter the same in the stores ledger after the last purchase entry. Subsequent issues will, therefore, be made on that basis.

Problem 15.

The particulars of receipts and issues of materials in a factory in August, 1983 are as under :

August	1	Opening balance :	1,500 kgs. @ 12·00 per kg.
	2	Issued	100 kgs.
	3	Issued	250 kgs.
	4	Issued	300 kgs.
	5	Received (purchase)	400 kgs. @ 12·50 per kg.
	9	Issued	300 kgs.
	10	Received (purchased)	200 kgs. @ 12·50 per kg.
	11	Issued	300 kgs.
	12	Returned from workshop out of issues on 3rd August	20 kgs.
	13	Issued	450 kgs.
	16	Received (purchase)	500 kgs. @ 13·00 per kg.
	18	Issued	400 kgs.
	20	Returned from workshop out of issues on 9th August	60 kgs.
	22	Issued	300 kgs.
	26	Received (purchase)	400 kgs. @ 12·00 per kg.
	29	Issued	200 kgs.

Pricing of issues is to be done on FIFO basis. A shortage of 10 kgs. was noticed on 16th August. Prepare the Stores Ledger Account for the month of August, 1933 in respect of the material. (*C.U., B. Com. Hons.*)

Solution :

STORES LEDGER ACCOUNT

Date	RECEIPTS				ISSUES				BALANCE			Remarks
	G.R.N. No.	Qty. (kg.)	Rate Rs.	Amount Rs.	S.R. No.	Qty. (kg.)	Rate Rs.	Amount Rs.	Qty. (kg.)	Rate Rs.	Amount Rs.	
1983 Aug. 1									1,500	12.00	18,000	
,, 2						100	12.00	1,200	1,400	12.00	16,800	
,, 3						250	12.00	3,000	1,150	12.00	13,800	
,, 4						300	12.00	3,600	850	12.00	10,200	
,, 5		400	12.50	5,000					850 {1,250 400	12.00 12.50	10,200} 15,200 5,000	
,, 9						300	12.00	3,600	550 {950 400	12.00 12.50	6,600} 11,600 5,000	
,, 10		200	12.50	2,500					550 {1,150 600	12.00 12.50	6,600} 14,100 7,500	
,, 11						300	12.00	3,600	250 {850 600	12.00 12.50	3,000} 10,500 7,500	
,, 12		20	12.00	240					270 {870 600	12.00 12.50	3,240} 10,740 7,500	Return from workshop
,, 13						450 {270 180	12.00 12.50	3,240} 5,490 2,250	420	12.50	5,250	
,, 16		500	13.00	6,500		10	12.50	125	410 {910 500	12.50 13.00	5,125} 11,625 6,500	Shortage
,, 18						400	12.50	5,000	500 {510 10	13.00 12.50	6,500} 6,625 125	
,, 20		60	12.00	720					60 {570 10 {500	12.00 12.50 13.00	720} 125} 7,345 6,500	Return from workshop
,, 22						60 {300 10 {230	12.00 12.50 13.00	720} 125} 3,835 2,990	270	13.00	3,510	
,, 26		400	12.00	4,800					270 {670 400	13.00 12.00	3,510} 8,310 4,800	
,, 29						200	13.00	2,600	70 {470 400	13.00 12.00	910} 5,710 4,800	

Problem 16.

BX Ltd. furnishes the following transactions in stores for April, 1985 :

1985

April	1	Opening balance	25 units value Rs. 162·50
	4	Issues Req. No. 76	8 units
	6	Receipts from P & Co. GRN No. 18	50 units @ Rs. 5·75 per unit
	7	Issues Req. No. 82	12 units
	10	Returns to P & Co.	10 units
	12	Issues Req. No. 95	15 units
	13	Issues Req. No. 102	20 units
	15	Receipts from Q & Co. GRN No. 26	25 units @ Rs. 6·10 per unit
	17	Issues Req. No. 108	10 units
	19	Received replacement from P & Co. GRN No. 30	10 units
	20	Returned from department, material out of issues on 17th, MRN No. 5	5 units
	22	Transfer from job 156 to job 159 in the Deptt. MTN 7	5 units
	26	Issues Req. No. 120	10 units
	29	Transfer from Deptt. 'A' to Deptt. 'B'	5 units
	30	Shortage in stock-taking	2 units

Write up the priced stores ledger applying FIFO method.

Solution :

STORES LEDGER ACCOUNTS

Date	G.R.N. No. / M.R.N. No.	RECEIPTS Qty. Units	RECEIPTS Rate Rs.	RECEIPTS Amount Rs.	ISSUES S.R. No.	ISSUES Qty. Units	ISSUES Rate Rs.	ISSUES Amount Rs.	BALANCE Qty. Units	BALANCE Rate Rs.	BALANCE Amount Rs.	Remarks
1985 April 1									25	6.50	162.50	
,, 4					76	8	6.50	52.00	17	6.50	110.50	
,, 6	18	50	5.75	287.50					17{50	6.50 / 5.75	110.50 / 287.50 } 398.00	
,, 7					82	12	6.50	78.00	5{50	6.50 / 5.75	32.50 / 287.50 } 320.00	
,, 10					—	10	5.75	57.50	5{40	6.50 / 5.75	32.50 / 230.00 } 262.50	Return to supplier
,, 12					95	15{5 / 10	6.50 / 5.75	32.50 / 57.50 } 90.00	30	5.75	172.50	
,, 13					102	20	5.75	115.00	10	5.75	57.50	
,, 15	26	25	6.10	152.50					10{25	5.75 / 6.10	57.50 / 152.50 } 210.00	
,, 17					108	10	5.75	57.50	25	6.10	152.50	
,, 19	30	10	5.75	57.50					25{10	6.10 / 5.75	152.50 / 57.50 } 210.00	
,, 20	5	5	5.75	28.75					40{25 / 5 / 10	6.10 / 5.75 / 5.75	152.50 / 28.75 / 57.50 } 238.75	Return from Department
,, 26					120	10{5 / 5	5.75 / 6.10	28.75 / 30.50 } 59.25	30{20 / 10	6.10 / 5.75	122.00 / 57.50 } 179.50	
,, 30					—	2	6.10	12.20	28{18 / 10	6.10 / 5.75	109.80 / 57.50 } 167.30	Shortage

Notes. [1] Receipts of materials on 19-4-85 as replacement from supplier has been treated as fresh supply.

[2] Transfer of materials from one job or department to another will not be recorded in the Stores Ledger.

Problem 17.

From the following details write Stores Ledger under simple average method :

1982

Dec.,	1	Opening Balance	100 kgs. @ Rs. 5·00
	5	Received	50 kgs. @ Rs. 5·20
	8	Issued	120 kgs.
	10	Issued	10 kgs.
	15	Received	80 kgs. @ Rs. 5·40
	18	Issued	50 kgs.
	20	Received	100 kgs. @ Rs. 5·60
	25	Issued	40 kgs.
	29	Issued	60 kgs.

The stock verifier found a shortage of 10 kgs. on 16.12.82 and another shortage of 10 kgs. on 26.12.82.   (*C. U., B. Com. Hons. '83*)

Solution :

Stores Ledger Account

Date	G.R.N. No.	RECEIPTS			ISSUE				BALANCE			Remarks
		Qty. Kg.	Rate Rs.	Amount Rs.	S.R. No.	Qty. Kg.	Rate Rs.	Amount Rs.	Qty. Kg.	Rate Rs.	Amount Rs.	
1982												
Dec. 1									100	5·00	500	
„ 5		50	5·20	260					150		760	
„ 8						120	5·10	612	30		148	
„ 10						10	5·20	52	20		96	
„ 15		80	5·40	432					100		528	
„ 16						10	5·30	53	90		475	Shortage
„ 18						50	5·30	265	40		210	
„ 20		100	5·60	560					140		770	
„ 25						40	5·50	220	100		550	
„ 26						10	5·60	56	90		494	Shortage
„ 29						60	5·60	336	30		158	

Working Note :

Calculation of simple average price :

$$\text{For Issue on 8th Dec.} \quad \frac{5\cdot00+5\cdot20}{2}=\text{Rs. } 5\cdot10$$

$$\text{„ Issue „ 10th „} \qquad\qquad = \text{Rs. } 5\cdot20$$

$$\text{„ Shortage „ 16th „} \quad \frac{5\cdot20+5\cdot40}{2}=\text{Rs. } 5\cdot30$$

$$\text{„ Issue „ 18th „} \qquad\qquad = \text{Rs. } 5\cdot30$$

$$\text{„ „ „ 25th „} \quad \frac{5\cdot40+5\cdot60}{2}=\text{Rs. } 5\cdot50$$

$$\text{„ Shortage „ 26th „} \qquad = \text{Rs. } 5\cdot60$$

$$\text{„ Issue „ 29th „} \qquad = \text{Rs. } 5\cdot60$$

Since there is only one lot of stores while issuing on 10th, 26th and 29th, the question of averaging does not arise.

Problem 18.

The following purchases were made of cast iron pipes 3″φ :

Stores Received Note No. 10 of 4th July, 1982, 20 at Rs. 15·00 each

Stores Received Note No. 53 of 17th July, 1982, 30 at Rs. 14·00 each

Stores Received Note No. 78 of 2nd August, 1982, 40 at Rs. 14·50 each

Stores Received Note No. 105 of 30th August, 1982, 30 at Rs. 13·00 each

The Issues were :

25 on 20th July—vide Requisition Slip No. 160

40 on 5th August—vide Requisition Slip No. 32

45 on 31st August—vide Requisition Slip No. 203

On 28th August, pipes issued on 20th July were received back.

On 29th August, 1 pipe was found to be damaged and had to be discarded.

Enter the above in the Stores Ledger using the Weighted Average method of pricing the issues. (Make calculations correct to two places of decimals).

Solution :

Stores Ledger Account

Date	G.R.N. No.	Qty.	Rate Rs.	Amount Rs.	S.R. No.	Qty.	Rate Rs.	Amount Rs.	Qty.	Rate Rs.	Amount Rs.	Remarks
		RECEIPTS				**ISSUE**				**BALANCE**		
1982												
July 4	10	20	15·00	300·00					20	15·00	300·00	
„ 17	53	30	14·00	420·00					50	14·40	720·00	
„ 20					160	25	14·40	360·00	25	14·40	360·00	
Aug. 2	78	40	14·50	580·00					65	14·46	940·00	
„ 5					32	40	14·46	578·40	25	14·46	361·60	
„ 28		2	14·40	28·80					27	14·46	390·40	Return
„ 29						1	14·46	14·46	26	14·46	375·94	Damage
„ 30	105	30	13·00	390·00					56	13·68	765·94	
„ 31					203	45	13·68	615·60	11	13·68	150·34	

Problem 19.

The following are the receipts and issues of stores material Y in a manufacturing concern :

1982

July 1. Opening stock 100 units at Rs. 10 per unit.

„ 2. Issued 25 units to Department A.

„ 7. Received 425 units at Rs. 11 per unit.

„ 10. Issued 200 units to Department B.

„ 12. Returned to stores 10 units from Department A.

„ 15. Returned to vendor 20 units out of the quantity received on 7th.

„ 17. Received 110 units at Rs. 12·50 per unit.

„ 25. Received 100 units at Rs. 10 per unit.

„ 29. Issued 200 units to Department B.

„ 30. Received 100 units at Rs. 11 per unit.

Enter the above transactions in the Stores Ledger Account of material Y, using the average cost (weighted) method. (Average cost to be calculated correct to two decimal places of a rupee).   (*I. C. W. A.—Inter.*)

Solution :

STORES LEDGER ACCOUNT

Date	G.R.N. No.	RECEIPTS			ISSUE				BALANCE			Remarks
		Qty.	Rate Rs.	Amount Rs.	S.R. No.	Qty.	Rate Rs.	Amount Rs.	Qty.	Rate Rs.	Amount Rs.	
1982												
July 1									100	10·00	1,000·00	
,, 2						25	10·00	250·00	75	10·00	750·00	
,, 7		425	11·00	4,675·00					500	10·85	5,425·00	
,, 10						200	10·85	2,107·00	300	10·85	3,255·00	
,, 12		10	10·00	100·00					310	10·82	3,355·00	Return to Stores
,, 15						20	11·00	220·00	290	10·81	3,135·00	Return to Vendors¹
,, 17		110	12·50	1,375·00					400	11·28	4,510·00	
,, 25		100	10·00	1,000·00					500	11·02	5,510·00	
,, 29						200	11·02	2,204·00	300	11·02	3,306·00	
,, 30		100	11·00	1,100·00					400	11·02	4,406·00	

Note :   ¹Return to vendors on 15th must be at the corresponding purchase price.

Problem 20.

For the six months ended October 31, an importer and distributor of one type of machine has the following transactions in his records. There was an opening balance of 100 units which had a value of Rs. 3,900.

Date	Bought quantity in units	Cost per unit
May	100	Rs. 41·000
June	200	Rs. 50·000
August	400	Rs. 51·875

The price of Rs. 51·875 each for the August receipt was Rs. 6·125 per units less than the normal price because of the large quantity ordered.

Date	Sold quantity in units	Price per unit
July	250	Rs. 64
September	350	Rs. 70
October	100	Rs. 74

From the information given above and using the weighted average, FIFO and LIFO methods for pricing the issues, you are required for each method to :

(a) show the stores ledger records including the closing stock balance and stock valuation ;

(b) prepare, in columnar format, Trading Accounts for the period to show that gross profit using each of the three methods of pricing the issues ;

(c) comment on which method, in the situation depicted, is regarded as the best measure of profit, and why.

Solution :

STORES LEDGER ACCOUNT

FIFO method—

Date	RECEIPTS				ISSUES				BALANCE		
	G.R.N. No.	Qty.	Rate Rs.	Amount Rs.	S.R. No.	Quantity	Rate Rs.	Amount Rs.	Quantity	Rate Rs.	Amount Rs.
b/f									100	39	3,900
May		100	41	4,100					200{100/100	39/41	3,900/4,100}8,000
June		200	50	10,000					400{100/100/200	39/41/50	3,900/4,100/10,000}18,000
July						250{100/100/50	39/41/50	3,900/4,100/2,500}10,500	150	50	7,500
August		400	51·875	20,750					550{150/400	50/51·875	7,500/20,750}28,250
September						350{150/200	50/51·875	7,500/10,375}17,875	200	51·875	10,375
October						100	51·875	5,187·50	100	51·875	5,187·50

LIFO method—

Date	RECEIPTS				ISSUES				BALANCE		
	G.R.N. No.	Qty.	Rate Rs.	Amount Rs.	S.R. No.	Quantity	Rate Rs.	Amount Rs.	Quantity	Rate Rs.	Amount Rs.
b/f									100	39	3,900
May		100	41	4,100					200{100/100	39/41	3,900/4,100}8,000
June		200	50	10,000					400{100/100/200	39/41/50	3,900/4,100/10,000}18,000
July						250{200/50	50/41	10,000/2,050}12,050	150{100/50	39/41	3,900/2,050}5,950
August		400	51·875	20,750					550{100/50/400	39/41/51·875	3,900/2,050/20,750}26,700
September						350	51·875	18,156	200{100/50/50	39/41/51·875	3,900/2,050/2,594}8,544
October						100{50/50	51·875/41	2,594/2,050}4,644	100	39	3,900

Weighted average method-

Date	G.R.N. No.	Qty.	Rate Rs.	Amount Rs.	S.R. No.	Qty.	Rate Rs.	Amount Rs.	Qty.	Rate Rs.	Amount Rs.
		RECEIPTS				**ISSUES**				**BALANCE**	
b/f									100	39·000	3,900
May		100	41	4,100					200	40·000	8,000
June		200	50	10,000					400	45·000	18,000
July						250	45·000	11,250	150	45·000	6,750
August		400	51·875	20,750					550	50·000	27,500
Sept.						350	50·000	17,500	200	50·000	10 000
October						100	50·000	5,000	100	50·000	5,000

Trading Accounts
for the period 6 months to 31st October

		FIFO	LIFO	Weighted average
		Rs.	Rs.	Rs.
Sales :				
250 @ Rs. 64	16,000			
350 @ Rs. 70	24,500			
100 @ Rs. 74	7,400	47,900	47,900	47,900
Opening stock		3,900	3,900	3,900
Purchases :				
100 @ Rs. 41	4,100			
200 @ Rs. 50	10,000			
400 @ 51·875	20,750	34,850	34,850	34,850
		38,750	38,750	38,750
Less : Closing stock		5,187·50	3,900	5,000
Cost of goods sold		33,562·50	34,850	33,750
Gross profit		14,337·50	13,050	14,150

When prices are rising the LIFO method of pricing the issues gives the best measure of profit, because it matches the latest known price with each sale. Stock sold has to be replaced, and it would be incorrect to report a profit unless provision had been made for replacing the stock used (at the latest reported price). Although the method does not completely fulfil this objective, it does give a closer approach to a 'going concern' profit. In doing so, however, it leaves a residual value for closing stocks which can be completely out of line with contemporary prices. Under the other two pricing methods the profit is overstated, as the cost of sales does not reflect current costs. If profits are overstated, cash is likely to be withdrawn from the business in the form of dividends, and it will not be available to maintain stocks at their present levels.

If purchases are made at special or exceptional prices, the figures may be misleading. In this example, the August purchase was at a specially low price [because the normal price is (51·875+6·125) or Rs. 58]. If the quantity ordered is not repeated the LIFO price will be much below

replacement cost. Hence the gross profit of Rs. 13,050, in this example, is somewhat misleading. It is too high and the other two figures of gross profit are even higher and thus even more misleading.

Had the normal or replacement cost of Rs. 58 (Rs. 51·875 + Rs. 6·125) been used, the profit would have been only Rs. 10,600 (Rs. 13,050   400 × 6·125) instead of Rs. 13,050 as shown under LIFO. It will, therefore, be more prudent to use replacement cost in order to show more realistic figures.

Problem 21

The following details apply to an annual budget for a manufacturing company :

Quarter	1st	2nd	3rd	4th
Working days	65	60	55	60
Production (units per working day)	100	110	120	105
Raw Material Purchases (% by weight of annual total)	30%	50%	20%	—
Budgeted purchase price (per kg.)	Re. 1	Rs. 1·05	Rs. 1·125	—

Quantity of raw materials per unit of production : 2 kg.
Budgeted opening stock of raw materials 4,000 kg. (cost Rs. 4,000)
Budgeted closing stock of raw materials 2,000 kg.
Issues are priced on FIFO basis.
Calculate the following budgeted figures :

(a) Quarterly and annual purchases of raw material, by weight and value.

(b) Closing quarterly stock by weight and value.

Solution :

(a) *Computation of quarterly and annual purchases* :
Consumption—

1st quarter 65 × 100 × 2 kg. = 13,000 kg.
2nd   ,,   60 × 110 × 2 kg. = 13,200 ,,
3rd   ,,   55 × 120 × 2 kg. = 13,200 ,,
4th   ,,   60 × 105 × 2 kg. = 12,600 ,,
                                    52,000 kg.

Annual purchases—

Consumption	52,000 kg.
Add : Closing stock	2,000 ,,
	54,000 ,,
Less : Opening stock	4,000 ,,
	50,000 kg.

Quarterly purchases—

1st quarter	30% of 50,000 kg. or 15,000 kg. @ Re. 1·00	15,000
2nd quarter	50% of 50,000 kg. or 25,000 kg. @ Rs. 1·05	26,250
3rd quarter	20% of 50,000 kg. or 10,000 kg. @ Rs. 1·125	11,250
	50,000 kg.	Rs. 52,500

(b) *Closing quarterly stock :*

Quarter	Purchase			Issue (FIFO)			Closing Stock		
	Weight kg.	Rate Rs.	Value Rs.	Weight kg.	Rate Rs.	Value Rs.	Weight Rs.	Rate Rs.	Value Rs.
Opening Stock	—	—	—	—	—	—	4,000	1·00	4,000
1st Quarter	15,000	1·00	15,000	13,000	1·00	13,000	6,000	1·00	6,000
2nd Quarter	25,000	1·05	26,250	13,200 {6,000 / 7,200}	{1·00 / 1·05}	{6,000 / 7,560} 13,560	17,800	1·05	18,690
3rd Quarter	10,000	1·125	11,250	13,200	1·05	13,860	14,600 {4,600 / 10,000}	{1·05 / 1·125}	{4,830 / 11,250} 16,080
4th Quarter	—	—	—	12,600 {4,600 / 8,000}	{1·05 / 1·125}	{4,830 / 9,000} 13,830	2,000	1·125	2,250

Problem 22.

The stock of materials of a company on 1.1.83 was 10,000 units at Rs. 2 per unit. Further purchases were made during the month as follows :

4th January   2,000 units @ Rs. 2·50 per unit
10th   ,,   5,000 ,,   @ Rs. 3·00 ,,   ,,
20th   ,,   10,000 ,,   @ Rs. 3·50 ,,   ,,

The issues during the period were as follows :
            12th January 16,000 units
            28th   ,,   9,000 ,,

What would be the value of the closing stock at the end of the month on the basis of materials being treated to have been issued according to :

    (i)   First-in first-out method ;
   (ii)   Weighted average method ;
  (iii)   Last-in first-out method ?

(C. U., B. Com. Hons.—Adapted)

Solution :

    (i)   *First-in first-out method*

Opening stock	10,000 units
Purchases	17,000 ,,
	27,000 ,,
Consumption	25,000 ,,
Closing stock	2,000 ,,

Value of closing stock :

   2,000 units @ Rs. 3·50 per unit = Rs. 7,000 (the rate has been Rs. 3·50, because the last purchase was for more than 2,000 units).

   (ii)   *Weighted Average Method*

	Qty. (Units)	Rate (Rs.)	Amount (Rs.)
1.1.83 Opening stock	10,000	2·000	20,000
4.1.83 Purchase	2,000	2·500	5,000
10.1.83 Purchase	5,000	3·000	15,000
	17,000	2·353[1]	40,000
12.1.83 Issue	16,000	2·353	37,648
,, Balance	1,000	2·353	2,352
20.1.83 Purchase	10,000	3·500	35,000
	11,000	3·396[2]	37,352
28.1.83 Issue	9,000	3·396	30,564
31.1.83 Closing stock	2,000	3·396	6,788

  Notes :   [1]Rs. 40,000/17,000 = Rs. 2·353
       [2]Rs. 37,352/11,000 = Rs. 3·396

(*iii*)   *Last-in first-out method*

	Rs. 2·00	Rs. 2·50	Rs. 3·00	Rs. 3·50
1.1.83 Opening stock	10,000			
4.1.83 Purchase		2,000		
10.1.83 Purchase			5,000	
12.1.83 Issue	9,000	2,000	5,000	
,, Balance	1,000	—	—	
20.1.83 Purchase				10,000
28.1.83 Issue				9,000
31.1.83 Balance	1,000	—	—	1,000

Value of closing stock :

	Rs.
1,000 units @ Rs. 2·00	2,000
1,000 ,, @ Rs. 3·50	3,500
	5,500

Comparative Statement

Method	Value of closing stock (2,000 units)
First-in first-out	Rs. 7,000
Weighted Average	Rs. 6,788
Last-in first-out	Rs. 5,500

Problem 23.

Sweetipies Ltd. uses large quantities of a sweetening material for its products. The following figures relate to this material during the calendar year, 1981 :

Quarter ended :	Purchases (Tons)	Invoice cost per ton Rs.	Consumption (Tons)
31st March	1,000	62	600
30th June	2,100	63	1,200
30th September	700	64	1,500
31st December	1,200	67	1,350
Market replacement costs :			
31st December, 1981		66	
31st December, 1980		61	

The stock of material on 31st December, 1980, was 1,000 tons valued for accounting purposes at cost of Rs. 60 a ton. Delivery of goods to the factory is made on the first day of each quarter.

You are required :

(a) to compute the value of the stock of material as on 31st December, 1981, applying (i) L.I.F.O. ; and (ii) F.I.F.O. and

(b) for internal accounting purposes to compare the effects, on the 1981 profits, of adopting each of the foregoing valuation methods in place of valuations based wholly on market replacement cost.

Solution :

Computation of Stock of Material
as at 31st December, 1981 on LIFO basis

				Tons at		
		Rs. 60	Rs. 62	Rs. 63	Rs. 64	Rs. 67
Stock at 31st December, 1980	..	1.000				
Quarter ended 31st March, 1981 :						
Purchases	...		1,000			
Consumption	...		600			
			400			
Quarter ended 30th June, 1981 :						
Purchases	...			2,100		
Consumption	..			1,200		
				900		
Quarter ended 30th September, 1981 :						
Purchases	...				700	
Consumption	...			800	700	
				100		
Quarter ended 31st December, 1981 :						
Purchases	...					1,200
Consumption	...		50	100		1,200
Balance	...	1,000	350	—	.	—

Value of stock at 31st December, 1981 :	Rs.
1,000 tons @ Rs. 60	60,000
350 tons @ Rs. 62	21,700
	Rs. 81,700

Computation of Stock of Material
as at 31st December, 1981 on FIFO basis

	Tons
Stock at 31st December, 1980	1,000
Purchases	5,000
	6,000
Consumption	4,650
Stock at 31st December, 1981	1,350
Value of stock at 31st December, 1981	
1,200 tons @ Rs. 67	80,400
150 tons @ Rs. 64	9,600
	Rs. 90,000

Statement showing the effect on profit

	Market replacement cost	LIFO	FIFO
	Rs.	Rs.	Rs.
Stock at 31st December, 1981, 1,350 tons	89,100 [1]	81,700	90,000
Less : Stock at 31st December, 1980, 1,000 tons	61,000 [1]	60,000 [2]	60,000 [2]
		21,700	30,000
	28,100	28,100	28,100
Reduction in profits for 1981	—	6,400	
Additional profits for 1981	—	--	1,900

Notes · [1]**Market replacement rate is Rs. 66 as on 31-12-81 and Rs. 61 as on 31-12-8**

[2]**Rate of stock as on 31-12-80 for accounting purpose is Rs. 60.**

Problem 24.

From the following transactions extracted from the books of accounts of a manufacturing concern as on 31st December, 1982, work out (a) consumption value of raw material in the month and (b) value of closing stock as on 31st December, 1982, under the following four methods of pricing the issues : (i) FIFO, (ii) LIFO, (iii) Simple Average Cost and (iv) Weighted Average Cost. Show the results in a tabular form.

1982			Quantity (units)	Rate per unit Rs.
Dec.	1	Opening Stock	300	9·70
	3	Purchase	250	9·80
	11	Issue	400	
	15	Purchase	300	10·05
	20	Issue	210	
	25	Purchase	150	10·30
	29	Issue	100	

Solution :

    (i)   *FIFO Method*

         Closing Stock : (300+250 - 400+300 — 210+150 - 100) or 290 units

         Value of closing stock :   Rs.

			Rs.
	140 units @ Rs. 10·05		1,407
	150 ,, @ Rs. 10·30		1,545
	290		2,952

Consumption—					Rs.
Opening Stock	300 units @ Rs. 9·70				2,910
Purchases	250 ,, @ Rs. 9·80		2,450		
	300 ,, @ Rs. 10·05		3,015		
	150 ,, @ Rs. 10·30		1,545		
	1,000				7,010
					9,920
Less : Closing Stock	290 units				2,952
Consumption	710 units				6,968

    (ii)   *LIFO Method*

			Units at			
			Rs. 9·70	Rs. 9·80	Rs. 10·05	Rs. 10·30
Dec.	1	Opening stock	300			
,,	3	Purchase		250		
,,	11	Issue 400	150	250		
			150	—		
,,	15	Purchase			300	
,,	20	Issue 210			210	
			150		90	
,,	25	Purchase				150
,,	29	Issue 100				100
,,	31	Balance	150		90	50

Value of closing stock

		Rs.
150 units @ Rs. 9·70		1,455·00
90 ,, @ Rs. 10·05		904·50
50 ,, @ Rs. 10·30		515·00
290		2,874·50

Consumption —

			Rs.
Opening Stock 300 units			2,910·00
Purchases 700 ,,	[Rs. (2,450+3,015+1,545)]		7,010·00
1,000 ,,			9,920·00
Less : Closing Stock 290 ,,			2,874·50
Consumption 710 ,,			7,045·50

i) *Simple Average Cost Method*

	Qty. (units)	Rate (Rs.)	Amount (Rs.)	Consumption (Rs.)
Opening Stock	300	9·700	2,910·00	
Purchase	250	9·800	2,450·00	
	550		5,360·00	
Issue	400	9·75[1]	3,900·00	3,900·00
	150		1,460·00	
Purchase	300	10·050	3,015·00	
	450		4,475·00	
Issue	210	9·925[2]	2,084·25	2,084·25
	240		2,390·75	
Purchase	150	10·300	1,545·00	
	390		3,935·75	
Issue	100	10·175[3]	1,017·50	1,017·50
Closing Stock	290		2,918·25	7,001·75

Working Notes : [1] (9·70 + 9·80) ÷ 2 = 9·75
[2] (9·80 + 10·05) ÷ 2 = 9·925
[3] (10·05 + 10·30) ÷ 2 = 10·175

(iv) *Weighted Average Cost Method*

	Qty. (units)	Rate (Rs.)	Amount (Rs.)	Consumption (Rs.)
Opening Stock	300	9·700	2,910·00	
Purchase	250	9·800	2,450·00	
	550	9·745	5,360·00	
Issue	400	9·745	3,898·00	3,898·00
Balance	150	9·745	1,462·00	
Purchase	300	10·050	3,015,00	
	450	9·949	4,477·00	
Issue	210	9·949	2,089·29	2,089·29
Balance	240	9·949	2,387·71	
Purchase	150	10·300	1,545·00	
	390	10·084	3,932·71	
Issue	100	10·084	1,008·40	1,008·40
Closing Stock	290	10·084	2,924·31	6,995·69

Comparative Statement

	Fifo	Lifo	S. Average	W. Average
Value of consumption (Rs.)	6,968	7,045·50	7,001·75	6,995·69
Value of closing stock (Rs.)	2,952	2,874·50	2,918·25	2,924·31
	9,920	9,920·00	9,920·00	9,920·00

Problem 25.

From the following information which relates to component Q, prepare statements using each of the following methods of stock accounting, viz. :

(i)   weighted average cost

(ii)   standard cost

(iii)   replacement cost

to show the following :

(a)   the amount to be charged to cost of production

(b)   the value of the closing stock

(c)   the difference, if any, between purchase cost and the aggregate of (a) and (b), indicating how such difference would be dealt with in the accounts.

	Receipts into stores (units)	Unit cost (Rs.)	Issues to production (units)	Market unit price (Rs.)
May 1	100	41		41
10	75	42		42
15			50	43
20		'	65	44
23	40	45		45
30			50	46

You may assume that the company had no opening stock of component Q and that in the case of method (ii) it is the company's practice to account for component Q in terms of a standard unit cost of Rs. 40.

Solution :

Weighted average cost

Date	RECEIPTS			ISSUE			BALANCE		
	Qty.	Rate Rs.	Amount Rs.	Qty.	Rate Rs.	Amount Rs.	Qty.	Rate Rs.	Amount Rs.
May 1	100	41	4,100				100	41	4,100
„ 10	75	42	3,150				175	41·429	7,250
„ 15				50	41·429	2,071	125	41·429	5,179
„ 20				65	41·429	2,693	60	41·429	2,486
„ 23	40	45	1,800				100	42·860	4,286
„ 30				50	42·860	2,143	50	42·860	2,143
			9,050			6,907			

		Rs.
(a)	Cost of production	6,907
(b)	Value of closing stock	2,143
	Aggregate of (a) and (b)	9,050
	Purchase cost	9,050
(c)	Difference	Nil

Standard cost—

		Rs.
(a)	Cost of production : 165 units @ Rs. 40	6,600
(b)	Value of closing stock : 50 units @ Rs. 40	2,000
	Aggregate of (a) and (b)	8,600
	Purchase cost	9,050
(c)	Difference	450

In the accounts, the difference of Rs. 450 (which represents adverse materials price variance) will be dealt with as follows :

          Materials Price Variance A/c   Dr.
               To Stores Ledger A/c

Replacement cost—

		Rs.	Rs.
(a)	Cost of production :		
	50 units @ Rs. 43	2,150	
	65 units @ Rs. 44	2,860	
	50 units @ Rs. 46	2,300	
			7,310
(b)	Value of closing stock : 50 units @ Rs. 46		2,300
			9,610
	Purchase cost		9.050
(c)	Difference		560

The favourable difference of Rs. 560 will be dealt with in accounts as follows :

          Stores Ledger Control A/c   Dr.
               To Stock Revaluation Reserve A/c

Problem 26.

Discuss the effects of adopting LIFO and FIFO on profits, with the help of the following figures :

Jan.	1	Opening balance—10 units (December 28th Purchase)	@ Rs. 30
	10	Purchased—10 units	@ Rs. 33
	12	Issued—10 units	
	31	Closing balance—10 units	
Feb.	3	Purchased—10 units	@ Rs. 36
	12	Issued—10 units	
	28	Purchased—10 units	@ Rs. 40

Sales during these two months amounted to Rs. 1,000.

Solution :

Method	Cost of sales	Closing stock	Sales	Gross profit
Fifo	Rs. 630	Rs. 760	Rs. 1,000	Rs. 370
Lifo	Rs. 690	Rs. 700	Rs. 1,000	Rs. 310

Under Fifo method. charge to cost of sales is Rs. 60 less, value of closing stock is Rs. 60 more and consequently gross profit is Rs. 60 more than those under Lifo method.

Thus. if Fifo method is applied in times of rising prices, the charge to cost of sales becomes unduly low (as the cost of replacing the stock issued will be higher than the price charged) and closing stocks are held at inflated price. The result is that. profits are inflated and hence also dividends, at the expense of working capital.

It may be noted that under Lifo method. charge to cost of sales represents, more or less. current replacement price, with under Fifo method it differs from the current replacement price. Under Fifo method, value of closing stock represents more or less. the current market price, while under Lifo method. the value of closing stock differs from the current market price.

EXERCISES

Theoretical :

1. Outline the procedure to be followed in a modern factory for purchase of raw materials till the payment of the bill therefor.　　　*(C. U., B. Com. Pass)*

2. Describe briefly a system of stores control suitable for a manufacturing business.

3. Describe fully the routine for control of the purchase and receipt of materials from outside suppliers.

4. Describe briefly the documents used in an organisation from the time a material is received in a factory till it is issued for consumption.　　　*(C. U., B. Com. Pass)*

5. What is a Purchase Requisition ? Draft a pro-forma of a Purchase Requisition and mention the information contained therein.

6. (a) State briefly the distinction between a purchase requisition and a purchase order.

　　(b) List six items of information that might appear on a purchase order.

　　(c) List six items of information that must appear on a Goods Received Note.

7. What is a Materials Requisition ? Draw up a specimen of a Materials Requisition with assumed figures.　　　*(C. U.. B. Com. Hons.)*

8. What is a 'Goods Received Note' ? What purposes does it serve ? Give a specimen form. To whom the copies may be sent and why ?　　*(C. U.. B. Com. Hons.)*

9. What do you mean by the expressions "Maximum Level", "Minimum Level" and "Re-ordering Level" ? What factors are to be taken into account in fixing these levels ? Discuss fully.　　　*(C. U., B. Com. Hons.)*

10. What do you understand by "Ordering Level" in connection with stock records ? How does it differ from the terms "Minmum" and "Maximum" stock ?

11. Discuss the considerations that influence the setting of "Maximum" and "Minimum" stock levels and "Re-ordering" level.　　　*(C. U., B. Com. Hons.)*

12. Discuss the significance of fixing 'Maximum', 'Minimum' and 'Ordering levels' for raw materials in a manufacturing concern.　　　*(C. U., B. Com. Hons.)*

13. As a stock controller your objectives are to ensure that materials are readily available as and when required and to avoid carrying of surplus stocks. How would you deal with the problem of stock levels and effective control of stores ? In your explanation refer to the following :

(a) Maximum level, (b) Minimum level, (c) Re-ordering level, (d) Re-ordering quantity.

14. Explain what is meant by the term *Economic Order Quantity*. Your explanation should be supported by a sketch or graph, which need not be on graph paper.

15. Discuss the following in the context of inventory control :

(a) Economic Ordering Quantity, (b) Ordering Level, (c) Goods Received Note.

16. State briefly the functions of the following records used in a cost accounting system :

(a) Bin Card, (b) Stores Ledger, (c) Stores Requisition. (*C. U., B. Com. Hons.*)

17. Give pro-forma ruling of (a) Bin Card and (b) Stores Ledger with 6 specimen items entered in each. (*C. U., B. Com. Hons.*)

18. Distinguish between Bin Card and Stores Ledger. Give a specimen of Bin Card with four imaginary transactions. (*C. U., B. Com. Hons.*)

19. Define a "Bill of Materials" and explain fully the purpose it serves. Give the specimen of a "Bill of Materials." (*C. U., B. Com. Hons.*)

20. Explain in detail as to what 'Perpetual Inventory" means and its system of working. What are the advantages of the system ? (*C. U., B. Com. Hons.*)

21. Explain the procedure of continuous stock taking and its advantages over annual stock taking. (*C. U., B. Com. Hons.*)

22. What do you mean by the 'Perpetual Inventory System' ? How does it differ from continuous stock taking ? State the advantages of the Perpetual Inventory System.

(*C. U., B. Com. Hons.*)

23. How do surpluses and deficiencies in stock arises and how can they be prevented ? Discuss how such difference should be treated in cost accounts.

24. While taking a physical count of stock it is found that in some cases there are surpluses while in some other cases there are deficiencies when compared with the stock records. What are the causes for such surpluses and deficiencies and how can these be prevented ? Discuss how such differences should be treated in Cost Accounts

(*C. U., B. Com. Hons.*)

25. It is found on the completion of a job that the materials requisitioned and received from stores is in excess of requirements. What should be the procedure in such circumstances ? Suggest a suitable form to be used in a case like this. State also what entries should be recorded and the particular records where such entries should be made. (*C. U., B. Com. Hons.*)

26. State the different methods of disposing of surplus materials already charged to a job.

27. (a) What objections would you have against a procedure where surplus materials are passed directly from one job to another. (b) In what circumstances, and with what safeguards, would you permit such a procedure ?

28. Indicate the significant features of the following documents, and show the layout of one of them with which you are familiar : (a) Goods Received Note, (b) Materials Returned Note, (c) Material Transfer Note, (d) Material Requisition.

29. State briefly, the functions of each of the following stores accounting records :

(a) Stores Ledger, (b) Stores Requisition, (c) Bin Cards, (d) Materials Return Note.

30. "Surplus materials of one job may either be returned to stores or transferred to other job." What procedure would you adopt ? Under what circumstances can each of the above alternatives be followed ? Illustrate the forms to be used in each case.

31. Indicate the different methods used for pricing the issues of stores and discuss their respective merits and demerits.

32. (a) Name six possible methods of costing individual issues of stock where several identical items have been purchased at different times.

(b) State briefly how each method determines the cost of an issue.

(c) Tabulate for each method one advantage and one disadvantage.

33. Explain with examples the following methods of pricing the issue of materials :

(a) FIFO ; (b) LIFO.

Under conditions of rising prices which of these methods would you recommend and why ?

34. In periods of (a) rapidly rising prices and (b) rapidly falling prices, state which of the following methods you would recommend for pricing material requisitions and valuing stocks at the end of the financial year :

(i) First-in, first-out method ; (ii) Average cost method ; (iii) Last-in, first-out method ; (iv) Standard cost method ; (v) Replacement cost method.

In your answer, briefly describe the characteristics of each method and make your recommendations.

35. Write short notes on the following methods of valuing material issues :

(a) Last-in, first-out ; (b) Average Price : (i) Simple and (ii) Weighted ; (c) Standard Price ; (d) Market Price.

36. What are the methods of pricing material issues ? When do you advocate for pricing the issues at the highest purchase price ?

37. Describe the following methods of valuing materials issued to production and discuss the advantages and disadvantages of each :

(a) First-in first-out, (b) Weighted average price, (c) Replacement price.

38. Discuss three of the accepted methods of pricing stores issues. Indicate which method will result in the most accurate costing of goods manufactured and sold during periods of rapid increases in prices of raw materials used in production.

(C. U., B. Com. Pass)

39. Write short notes on : (a) Bin Card, (b) Perpetual Inventory, (c) Weighted Average Price, (d) Bill of Materials, (e) Purchase Requisition, (f) Stores Ledger.

(G. U., B. Com. Pass)

40. Write short notes on : (a) Stores Requisition, (b) Inventory Turnover, (c) ABC System of Stock Control, (d) Goods Received Note.   *(C. U., B. Com. Hons.)*

Practical :

1. Two components *A* and *B* are used as follows :

Normal usage	60 units per week, each
Minimum usage	40 units per week, each
Maximum usage	80 units per week, each
Re-ordering quantity	*A*--500 units
	B—400 units
Re-order period	*A*—2 to 4 weeks
	B—4 to 6 weeks

Calculate for each component :

(a) Re-ordering level   (b) Minimum level

(c) Average stock level   (d) Maximum level

2. Two components *A* and *B* are used as follows :

Normal usage	50 per week, each
Minimum usage	75 per week, each
Maximum usage	25 per week, each
Re-ordering quantity	*A*—300 ; *B*—500
Re-order period	*A*—4 to 6 weeks ; *B*—2 to 4 weeks

Calculate for each component :

(a) Re-ordering level, (b) Minimum level, (c) Maximum level, (d) Average stock level.

Comment briefly on the difference in the levels for the two components.

3. Pradeep Ltd. uses three types of materials *A*, *B* and *C* for production of 'X', the final product. The relevant monthly data for the components are given below :

	A	*B*	*C*
Normal usage (in units)	200	150	180
Minimum usage (,,)	100	100	90
Maximum usage (,,)	300	250	270
Re-order Quantity (,.)	750	900	720
Re-order Period (in month)	2 to 3	3 to 4	2 to 3

Calculate for each component—

(a) Re-order Level

(b) Minimum Level

(c) Maximum Level

(d) Average Stock Level

4. Using the information given below, you are required to prepare a schedule showing the associated costs if 1, 2, 3, 4, 5, or 6 orders were placed during a year for a single product. From your schedule, state the number of orders to be placed each year and the economic order quantity.

Annual usage of product	600 units
Unit cost of product	Rs. 2·40
Cost of placing an order	Rs. 6·00
Stock holding cost (as a percentage of average stock value)	20%

Comment briefly on three problems met in determining the economic order quantity.

5. A manufacturer uses 200 units of a component every month and he buys them entirely from outside suppliers. The order placing and receiving cost is Rs. 100 per order and annual carrying cost is Rs. 12. From this set of data calculate the Economic Order Quantity.

6. The annual demand for an item is 3,200 units. The unit cost is Rs. 6 and inventory carrying charges are 25% per annum. If the cost of one procurement is Rs. 150, determine (i) Economic Order Quantity ; (ii) No. of orders per year ; (iii) Time between two consecutive orders.

7. A factory requires 1,500 units of an item per month, each costing Rs. 27. The cost per order is Rs. 150 and the inventory carrying charges work out to 20% of the average inventory. Find out the economic order quantity and the number of orders per year.

Would you accept a 2% price discount on a minimum supply quantity of 1,200 units ? Compare the total costs in both the cases.

8. A company is trying to establish a control policy to reduce inventory cost of a spare-part no. 00304-177. The financial manager estimates that a three-week delivery schedule can be expected. The purchase price per unit is Rs. 6 and purchase order cost is Rs. 24 per order. The total purchase requirement for a 50-week year is estimated to be 4,000 units and carrying costs are estimated at 20% of average inventory value.

You are required to compute : (i) the economic order quantity ; (ii) the optimal number of orders to be placed ; and (iii) the minimum level of inventory before re-ordering.

9. The following, relating to inventory costs, have been established for a company :

(i) Orders must be placed in multiples of 100 units. (ii) Requirements for the year are 3,00,000 units. (iii) The purchase price per unit is Rs. 3. (iv) Carrying cost is 25 per cent of the purchase price of goods. (v) Cost per order placed is Rs. 20. (vi) Desired safety stock is 10,000 units, (this amount is on hand initially). (vii) Three days are required for delivery.

Calculate : (i) EOQ. (ii) How many orders should the company place each year ? (iii) At what inventory level should an order be placed ?

10. (a) A company uses 5,120 units of a component in a year. The purchase price per unit of the component is Rs. 5 and the carrying cost including interest is estimated at 20% of the average inventory investment on annual basis. The cost of placing an order and processing the delivery is Rs. 10.

Ascertain the Economic Order Quantity and the number of orders, each of the Economic Order Quantity, to be placed for the component in a year.

(b) Assuming that the average daily consumption of the above component is 14 units and that the normal lead time is 15 days, calculate the Ordering Level for the component, where safety stock is considered to be equal to 25 days consumption. State why ordering level is fixed.

(C. U., B. Com. Hons. '87)

11. The following are the purchases and issues of materials in a factory :

1982			
March 1	Opening Stock	400 units	@ Rs. 4 per unit
2	Purchased	50 units	@ Rs. 5 per unit
8	Issued	200 units	
12	Purchased	600 units	@ Rs. 6 per unit
15	Issued	400 units	
18	Issued	100 units	
25	Issued	200 units	
30	Purchased	450 units	@ Rs. 7 per unit
31	Issued	300 units	

Write up the Stores Ledger under FIFO method.

(C. U., B. Com. Pass '82)

12. Record the following transactions in Stores Ledger under LIFO method :

1982

Jan.	1	Opening Stock	200 pieces @ Rs. 2 each
	2	Issues	150 „
	5	Purchases	100 „ @ Rs. 2·20 each
	7	Issues	100 „
	10	Purchases	150 „ @ Rs. 2·40 each
	12	Issues	100 „
	20	Purchases	180 „ @ Rs. 2·50 each
	28	Issues	200 „

(C. U., B. Com. Pass, '83)

13. On the basis that the material received last is to be taken as the first to be issued, write up Stores Account from the following information :

Purchases made :

January	4	500 kg. @ Rs. 2 per kg.
	15	350 kg. @ Rs. 2·10 per kg.
	21	400 kg. @ Rs. 2·25 per kg.
	31	600 kg. @ Rs. 2·15 per kg.

and issues therefrom as :

January	16	750 kg.
	24	300 kg.
February	1	620 kg.

14. The stock in hand of a particular material as on 1st April, 1983 was 500 units @ Rs. 2·00 per unit. The following purchases and issues were subsequently made. Prepare the Stores Ledger Account under LIFO method :

1983		*Purchases*	1983		*Issues*
April	6	100 units @ Rs. 2·10	April	7	550 units
„	10	700 „ @ Rs. 2·20	„	11	450 „
„	17	400 „ @ Rs. 2·30	„	18	400 „
„	20	1,000 „ @ Rs. 2·40	„	22	750 „
„	24	500 „ @ Rs. 2·50	„	23	300 „
„	26	400 „ @ Rs. 2·60	„	30	500 „

(C. U., B. Com. Pass, '85)

15. The following are the particulars of receipts and issues of materials in a factory during January, 1980 :

Jan.	1	Opening Balance	1,000 kg. @ Rs. 20 per kg.
	10	Issued to Jobs	500 kg.
	12	Received from Supplier	400 kg. @ Rs. 30 per kg.
	14	Return of surplus from a Job	30 kg. @ Rs. 25 per kg.
	15	Issued to Jobs	305 kg.
	20	Received from Supplier	600 kg. @ Rs. 34 per kg.
	25	Issued to Jobs	550 kg.
	29	Received from Supplier	600 kg. @ Rs. 35 per kg.
	31	Issued to Jobs	350 kg.

You are required to prepare statements to show how the values of the issues and balances of materials should be arrived at under the LIFO and FIFO systems. *(N. B. U., B. Com. Hons.)*

Cost (Part I)—10

16. The following are the particulars of the receipts and issues of materials in a factory during January, 1980 :

Jan.	2	Opening Balance	1,000 kg. @ Rs. 30
	3	Issued	140 kg.
	4	Issued	200 kg.
	8	Issued	160 kg.
	13	Received from Vendor	400 kg. @ Rs. 35
	15	Return of surplus from a work order	30 kg. @ Rs. 28
	16	Issued	360 kg.
	18	Received from Vendor	600 kg. @ Rs. 32
	20	Issued	550 kg.
	22	Received from Vendor	400 kg. @ Rs. 34
	24	Issued	250 kg.
	29	Return of surplus from a work order	40 kg. @ Rs. 32
	30	Received from Vendor	200 kg. @ Rs. 36

Prepare separate statements, showing how the value of the issues noted above should be arrived at under the LIFO and FIFO methods.

(C. U., B. Com. Hons.)

17. The following is an extract of the record of receipts and issues of sulphur in a chemical factory during January, 1983 :

Jan.	1	Opening Balance	500 tons @ Rs. 200
		Issued 250 tons	
	13	Received from supplier	200 tons @ Rs. 190
	16	Issued 180 tons	
	20	Received from supplier	240 tons @ Rs. 180
	24	Issued 300 tons	
	25	Received from supplier	320 tons @ Rs. 190
	28	Issued 200 tons	
	29	Returned from department	30 tons @ 190

Issues are to be priced on the principle of first-in first-out. The stock verifier of the factory had found a shortage of 10 tons on 22nd January and left a note accordingly. Draw up a priced stores ledger card for the material, showing the above transactions.   *(C. U., B. Com. Hons.)*

18. The particulars of receipts and issues of a certain material during January, 1987 are given below :

Date		Receipts	Units	Rate per Unit	Date	Issues	Units
Jan. 6		Purchased	450	Rs. 25·00	Jan. 3		600
„ 12		Purchased	600	Rs. 24·50	„ 8		500
„ 15		Return from workshop			„ 18		250
		(Issued on Jan. 3)	50		„ 24		300
„ 22		Purchased	350	Rs. 26·00	„ 27		100
„ 25		Purchased	500	Rs. 27·00	„ 31		800

Further information :

Opening Balance on January 1, 1987 :   1,000 units @ Rs. 24 per unit. A shortage of 15 units was noticed and recorded on January 9, 1987.

Prepare Stores Ledger in respect of the material for the month of January, 1987 under the *LIFO* system.   *(C. U., B. Com. Hons. '87)*

19. The following transactions took place in respect of an material :

Date	Receipts (quantity)	Rate Rs.	Issue (quantity)
2-3-83	200	2·00	—
10-3-83	300	2·40	—
15-3-83	—	—	250
18-3-83	250	2·60	—
20-3-83	—	—	200

Prepare a priced ledger sheet pricing the issues at (a) simple average rate and (b) weighted average rate. *(I. C. W. A.—Inter.)*

20. The following is the record of receipts and issues of a certain material in your factory in a month :

1-6-83	Opening Balance	50 kg. @ Rs. 20 per kg.
5-6-83	Issued	30 kg.
12-6-83	Received	40 kg. @ Rs. 22 per kg.
15-6-83	Issued	30 kg.
27-6-83	Received	40 kg. @ Rs. 24 per kg.
30-6-83	Issued	50 kg.

Draw up the Stores Ledger Card under (a) simple average basis, (b) periodic simple average basis. (c) weighted average basis and (d) periodic weighted average basis.

21. Prepare the Stores Account for the month of December. 1982 from the following transactions relating to the receipt and supply of material on the basis of : (a) Simple Average Price ; (b) Weighted Average Price.

Date of Receipt	Quantity of Material	Rate
2-12-82	200 kg.	Rs. 10 per kg.
17-12-82	300 kg.	Rs. 12 per kg.
24-12-82	100 kg.	Rs. 16 per kg.

Date of Issue	Quantity of Material
5-12-82	100 kg.
21-12-82	200 kg.
28-12-82	200 kg.

22. As the cost accountant responsible for the stores ledger at Briton Ltd., you are presented with the following information relating to raw material stock movements, for the three months ended 30th June, 1986 :

Stock at 1st April, 1986	7,240 units at Rs. 11 per unit

Purchases :

3rd April, 1986	4,240 units at Rs. 12 per unit
15th May, 1986	9,217 units at Rs. 13 per unit
17th June, 1986	2,490 units at Rs. 10 per unit

Transferred to work-in-progress

	Units
2nd April, 1986	4,170
12th April, 1986	6,716
12th May, 1986	494
1st June, 1986	7,460

You are required :

(a) to prepare statements in value and quantity terms for stock movement for the three months ended 30 June, 1986 on the basis of :

(i) weighted average price, and

(ii) first-in first-out, and

(b) to suggest two other methods which could be used to record the receipts and issues of raw materials.

23. The following transactions are recorded in respect of materials used in a factory :

Date	Qty. received units	Rate per unit Rs.	Qty. issued units
3-12-80	400	2·10	—
15-12-80	500	2·20	—··
20-12-80	—	—	500
26-12-80	600	2·50	—
28-12-80	—·	·	900

Prepare a priced stores ledger sheet pricing the issues on weighted average method.

24. A manufacturing company produces an item (*Part No. P 1562*) in batches which are transferred to its Finished Stock Account. There were 400 items in stock on June 3, 1986 and these were recorded at a cost price of Rs. 8·60 each. Prices were shown in the stock ledger on the weighted average cost basis.

During the four weeks ended June 30, 1986 the following transactions in this item were recorded :

	Receipts	*Issues*
June 4	—	160 units
8	240 units at Rs. 9·000 per unit	—
13	—·	300 units
18	400 units at Rs. 9·090 per unit	—
25	—	200 units
27	120 units at Rs. 9·625 per unit	—
29	—	360 units

Physical stock taking was carried out on June 30, 1986 and there were 120 items in stock.

You are required to record the transactions shown above in the Finished Stock Account, *Part No. P 1562,* and (b) indicate the value of (i) the total issues during the period, (ii) the stock at June 30, 1986, and (iii) the stock losses.

25. Set up "Stores Ledger" form and enter the following transactions therein adopting the *weighted average* method of pricing the issues :

1982

Aug. 1 Opening Balance—50 units @ Rs. 3 per unit

5 Issued to production—2 units.

1982

Aug. 7 Purchased 48 units @ Rs 4 per unit.

9 Issued 20 units to production.

19 Purchased 76 units @ Rs. 3 per unit.

24 Received back into stores 19 units out of 20 units issued on 9th August. 1982.

27 Issued to production –10 units.

26. With the help of the following information, prepare the Stores Ledger Card based on the *weighted average* method of pricing the issues :

1985

Sept. 1 Opening Balance 24,000 kgs. @ Rs. 7,500 per tonne

1 Purchase 44,000 kgs. @ Rs. 7,600 per tonne

1 Issue 10,000 kgs.

5 Issue 16,000 kgs.

12 Issue 24,000 kgs.

13 Purchase 10,000 kgs. @ Rs. 7,800 per tonne

18 Issue 24,000 kgs.

22 Purchase 50,000 kgs. @ Rs. 8,000 per tonne

28 Issue 30,000 kgs.

30 Issue 22,000 kgs.

(*Hints* : 1,000 kgs.=1 tonne.)

27. The following information is extracted from the Stores Ledger :

Material B

Opening stock	Nil
Purchases :	
January 1	100 @ Re. 1 per unit
January 18	100 @ Rs. 2 per unit
Issues :	
January 20	60 for Job No. 268
January 25	60 for Job No. 269

Complete the receipts and issues valuation by adopting the *first-in first-out, last-in first-out* and the *weighted average* methods. Tabulate the values allocated to Job No. 268, Job No. 269 and the closing stock under the aforesaid methods and discuss, from different points of view, which method you would prefer.

28. The stock ledger analysis for a type of material used in a manufacturing process shows :

		Units	Cost per unit Rs.	Issues during the month		
Stock at	1-1-85	60	15·00	Jan.	'85	50 units
Purchases	31-1-85	80	15·50	Feb.	'85	60 units
Purchases	28-2-85	50	15·75	Mar.	'85	60 units
Purchases	31-3-85	100	15·50	Apr.	'85	90 units
Purchases	30-4-85	60	15·25			

You are required :

(i) to show the stores ledger account from 1.1.85 to 30.4.85 using (a) the weighted average method ; (b) the first-in first-out method ;

(ii) to comment on the effect of each method on stock valuation and cost of production.

29. The following are the details supplied by J. K. Corporation in respect of its raw materials for the month of December, 1988 :

Date	*Receipts*		*Issues*
	(units)	Price per unit (Rs.)	(units)
1.12.88	2,000	5·00	
	(opening)		
7.12.88	1,000	6·00	
10.12.88			2,500
15.12.88	2,000	6·50	
31.12.88			2,200

On 31.12.1988 a shortage of 100 units was found. Find the values of issues and resulting stocks on different dates using (*i*) LIFO ; (*ii*) FIFO and (*iii*) Simple Average methods.   (*C. U., B. Com. Hons.* '89)

30. From the following data compute the value of the 40 units closing stock under (a) the FIFO method ; (b) LIFO method, and (c) the weighted average method :

Receipts :	1-8-83	60 units at Rs. 20 each
	7-8-83	60 units at Rs. 25 each
Issues :	3-8-83	40 units
	8-8-83	40 units

31. Show the year-end value of inventory under FIFO and LIFO methods from the following data :

Opening balance 12,000 units @ Rs. 2·00 per unit

	Received (units)	*Issued (units)*
1st Quarter	20,000 @ Rs. 2·20	16,000
2nd Quarter	30,000 @ Rs. 2·40	26,000
3rd Quarter	25,000 @ Rs. 2·30	32,000
4th Quarter	10,000 @ Rs. 2·25	8,000

Assume that purchases were made on the first day of the quarter.

32. Good Luck & Co. Ltd. purchased materials and issued the same from its Stores Department in the following order in the month of January :

1985

Jan.	1	Purchased	300 units	@ Rs. 4·00 per unit
	4	,,	600 ,,	@ Rs. 5·00 ,, ,,
	6	Issued	500 ,,	
	10	Purchased	700 ,,	@ Rs. 5·00 ,, ,,
	15	Issued	800 ,,	
	20	Purchased	300 ,,	@ Rs. 6·00 ,, ,,
	28	Issued	100 ,,	

Ascertain the values, in each case, of issues and the closing stock as on 31st January, 1985 on the following methods of valuation :

(a) Average cost (simple), (b) First-in first-out (FIFO) and (c) Last-in first-out (LIFO).   (*Gauhati University B. Com. '85—Adapted*)

33. At the beginning of October, 1980 Quality Brush Company had in stock 10,000 brushes valued at Rs. 10 each.

Further purchases were made during the month as follows :

    7th October—4,000 Brushes @ Rs. 12·50
    14th October—6,000   ,,   @ Rs. 15·00
    24th October—8,000   ,,   @ Rs. 16·50

Issues to shop floor were as follows :

    16th October—16,000 Brushes
    28th October—10,000   ,,

You are required—

(a) to prepare a stores ledger card for the month of October, 1980 on the assumption that materials were issued on the first-in first-out principle, and

(b) to state the value of closing stock at the end of October, had the issues been priced on the weighted average method.

34. Indian Oil Corporation has two petrol pumps at Tirupati, *A* and *B*. On 1st January, 1985 both had an inventory of 10,000 litres of petrol at Rs. 6·80 per litre. During January, 1985, I.O.C. has supplied 10,000 litres to each pump, *A* and *B*, at Rs. 7·00 per litre. The sales at each station amounted to 12,000 litres at Rs. 7·80 per litre. *A* followed FIFO method for pricing the issues, while *B* followed LIFO method. Determine the profits made at both the pumps and their closing stock values.

(Sri Vankateswara Univ.—B. Com.)

35. Bharat Oil Co., is a bulk distributor of petrol. A periodic inventory of petrol on hand is taken when the books are closed at the end of each month. The following summary of information is available for the month of August, 1986 :

	Rs.
Sales	9,45,000
General Administration cost	25,000
Opening Stock : 1,00,000 litres @ Rs. 3 per litre	3,00,000

Purchases (including freight in)

    August, 1st 2,00,000 litres @ Rs. 2·85 per litre
    August, 31st 1,00,000 litres @ Rs. 3·03 per litre
    Closing Stock, August 31st 1,30,000 litres

Compute the following data by the first-in first-out, weighted average and last-in first-out methods of inventory costing :

(a) Value of inventory on August 31st.

(b) Amount of the cost of goods sold for August.

(c) Profit or Loss for August.

36. The Stores Ledger Account of Material *C* in the books of Chemical Processor Ltd. revealed the following transactions for the month of November, 1982 :

Nov. 1 Opening Stock 200 kg. @ Rs. 7·50 per kg.

     5 Received from supplier S1, 400 kg. @ Rs. 7·75 per kg. (GRN No. 443)

     8 Issued to production deptt. 240 kg. (S.R. No. 883)

   10 Issued to production deptt. 160 kg. (S.R. No. 897)

   12 Received from supplier S2, 500 kg. @ 7·90 per kg. (GRN No. 458)

   15 Issued to production deptt. 400 kg. (S.R. No. 912)

   16 Received from supplier S3, 250 kg. @ Rs. 8·00 per kg. (GRN No. 461)

   19 Received from supplier S1, 600 kg. @ Rs. 8·25 per kg. (GRN No. 469)

   21 Issued to production deptt. 350 kg. (S.R. No. 946)

   24 Issued to production deptt. 260 kg. (S.R. No. 959)

   27 Issued to production deptt. 340 kg. (S.R. No. 974)

You are requested to price the issues and draw out the closing balances in the form of stores ledger accounts separately under the pricing methods which suit the following two alternative conditions respectively :

(A) The closing balances should be closely related to the current market prices.

(B) The materials costs charged to production should be closely related to the current market prices.   (*I. C. W. A., Inter. Adapted*)

     (*Hints* : In case of *A* follow FIFO and in case of *B* follow LIFO).

37. The Stores Ledger Accounts of a manufacturing company reveal the following entries in respect of a particular material :

Date 1982	Receipts Quantity (units)	Rate Rs.	Amount Rs.	Issue Quantity (units)	Issue Price	Amount Rs.
Jan. 2	4,000	1·80	7,200			
5	2,000	1·75	3,500			
18				10,000		19,500
Feb. 3				5,000		9,750
14	3,000	1·85	5,550			
18	3,000	1·90	5,700			
20				10,000		19,200

Opening stock as on 1-1-82 was 20,000 units valued at Rs. 40,000. Closing stock as per physical verification on 28-2-82 was 6,950 units.

Work out the method of pricing the issues which, you consider, has been adopted for the issues of the material and show the working of the issue rates (correct to 2 places of decimal). Complete the account of the material and work out the value of the closing stock as on 28-2-82 on the basis of valuation adopted. Also work out the value of the closing stock under any other method of valuation you are familiar with.

     (*Hints* : Weighted Average Method has been followed).

38. Based on the information shown below for a particular raw material you are required :

     (a) to calculate the amounts to be charged to cost of production and

(b) to show the value of closing stock, under each of the following methods of stock accounting :

    (i) FIFO,

    (ii) LIFO,

    (iii) Weighted average,

    (iv) Standard cost,

    (v) Replacement cost ;

(c) For b(iv) and b(v) calculate any differences arising, and indicate how these differences would be treated in Cost Accounts.

March 1	Received	1,000 litres at Rs. 5·50 per litre
March 2	Received	500 litres at Rs. 7·00 per litre
March 3	Issued	800 litres
March 4	Received	700 litres at Rs. 8 0.) per litre
March 5	Issued	1,000 litres

Current standard price Rs. 6·00 per litre

Current market price per litre :

March 1	Rs. 5·50
March 2	Rs. 7·00
March 3	Rs. 7·00
March 4	Rs. 8·00
March 5	Rs. 8·50

SECTION I

INTRODUCTION

Labour Cost ranks second in importance (first being the material cost) in the total cost of production. Labour cost represents human contribution. From the point of view of sensitivity of the various elements of cost, labour cost is the most sensitive, because it relates the human behaviour. Control of labour cost, therefore, requires a completely different approach from those required for control of other elements of cost. For the purpose of control of labour cost, the study of the behaviour of labour, measurement of performances, analysis of the results, time and motion study, control on the attendance and departure, humane approach in all matters, are essential.

Labour is such an element that can not be stored for future. It is, therefore, similar to the most perishable material. If material is kept idle it does not mean loss, unless such material is most perishable in nature, but if labour is kept idle is means loss, because remuneration has to be paid for such idle time. In modern labour management, labour has to be treated as one in the organisation and hence except with humane approach, no problem with labour can be successfully tackled. Any measure taken by the management affecting the social, political and financial interest of labour may have far-reaching effect resulting into strike, disruption in work and drainage of money. The present day management, therefore, enters into term agreements with the labour unions and faithfully obey the obligations mentioned therein. The awards of tribunals etc. are also obeyed in toto in order to keep industrial peace unaffected.

The control of labour cost means the *control of labour cost per unit*. So, if more output can be obtained against the same rate of remuneration, unit cost is reduced. Thus, *reduction in labour cost does not mean wage-cut*. It may mean more output for the same wage or more output for higher wage etc. so that the Unit Cost is reduced.

Let us now look into the different types of labour engaged by industrial undertakings :

    (a) *Regular Labour*
    (b) *Casual Labour*
    (c) *Hired Labour*
    (d) *Out workers.*

Labour recruited on the basis of permanent requirements may be termed *'regular labour'*, those engaged on temporary basis as and when required may be termed *'casual labour'*, those hired through labour contractors or agents

may be termed *'hired labour'* and those recruited as regular or casual labour but sent to sites or customers' premises, are termed *'out workers'*.

Besides the above classification, workers of all categories may be classified into *skilled labour* and *unskilled labour*.

Recruitment of workers

Workers are recruited on the basis of sanctioned strength in each department through employment exchange, advertisement etc., selection being made through interview, trade test, medical examination etc. Sometimes panels are made and workers are recruited from the panel as and when required. *By recruitment, the number of workers sanctioned must not be exceeded except in extraordinary situation. In that case also, prior sanction of extra hands must be obtained.*

The task of appointment is done by a separate department called *Personnel Department or Employment Department or Labour Bureau.* The process of appointment starts from the submission of demand by any department in prescribed form showing the job specification, amongst other things, and on the basis of unutilised sanctioned strength of the department.

After the employment of a worker he is posted to the department concerned. Wages department is simultaneously informed so that he may be placed on the *roll* for booking of his attendance and departure. A card called *Service History Card* or *Employees Personal Record* is opened. The card records all necessary details of the worker in relation to his employment in the organisation i.e., name, address, qualifications, experience, date of birth, place of birth. Clock No., Insurance Card No., Provident Fund A/c No., Trade, grade, rate of pay, date of entry, date of permanent employment, date of discharge with reasons etc.

Each worker is allotted a number called *ticket no.* or *token no.* or *clock no.* or *check no.* This number is the worker's identification. Two workers having the same name and surname are identified by their different numbers. The entire factory may have one series of ticket numbers or different departments may have different series of ticket numbers.

Retrenchment of workers

As the labour is very sensitive element, retrenchment of worker, wherever necessary, should be done strictly according to rules and procedure, mutually agreed upon by the employer and employees, otherwise good labour relations may be disturbed. A worker should be allowed to explain himself in any charge against him for misconduct, insubordination. inefficiency etc , before the decision for retrenchment is taken. Lay off or retrenchment in case of shortage of work can be done only in certain conditions laid down in the Acts/Tribunal Awards etc.

It is a common rule that *a man who hires can fire only* i.e., a person who is authorised to recruit is only authorised to retrench.

SECTION II

TIME-KEEPING

　　In every organisation, the opening time, the closing time, the lunch break, the total working hours per day and per week and also the weekly holiday are clearly specified. The normal working hours per day and per week are fixed, keeping in view the provisions of Factories Act on over-time work, because any work done beyond the normal working hours is regarded as overtime work. The Factories Act (India) fixed *nine hours* as the maximum normal working hours in any day and *fortyeight hours* in any week for any adult worker. So the employer and the employees can agree to any number of hours below *nine* in any day or below *fortyeight hours* in any week, but never to any number of hours exceeding *nine* in any day or *fortyeight* in any week as the normal working hours, because that will be *ultra vires*.

　　In view of the above, the recording of attendance and departure of every worker is essential. This recording of attendance and departure done mainly for administrative and payment purposes, is called '*Time-keeping*'.

Mechanisms for Time-keeping :

　　Recording of attendance and departure may be done in two ways— (i) *Manually* and (ii) *Mechanically*. How time-keeping shall be done depends upon management's policy which is taken after considering the need : resources : number of workers : chances of malpractices, fraudulent payments, dummy workers etc.

Manual Recording

(i) *Hand recording*

　　In this case, an attendance register with sufficient columns is prepared showing the names of the employees. If the number of workers is small, one register is enough. If the number is big, one register for each department shall be required.

　　(a) If the workers are literate they may sign. Otherwise the attendance is recorded by 'visual check' of attendance by some person entrusted with the duty. Late attendance is recorded with time of attendance. Absence is also marked as such.

　　This method is simple, but it is almost out of use, because of the following difficulties—

　　The attendance clerk may manipulate the entries due to his collusion with any worker.

　　(b) Mistakes may creep in while marking late attendance, calculating overtime work, and marking short leave etc.

　　(c) There may be suspicion in the minds of the illiterate workers regarding the attendance records.

　　This method is still followed for recording the attendance of the *out workers.*

(ii) *Disc/Token/check recording*

In this case, each worker is allotted a metal disc on which his token number is engraved. There are two boards, in-board and out-board, with hooks serially numbered. The discs of the workers remain hung up with the hooks systematically in the out-board which is placed at the gate before opening time. As a worker enters the factory, he takes his disc from the out-board and places on the in-board on the respective hook. After the normal attendance time, if any worker enters he does not find the in-board (which is removed) but he finds a separate box called *late box* in which he has to place his disc. The attendance clerk records the timely attendance and late attendance on the basis of the discs on the in-board and the discs in the late box respectively. The workers whose discs remain in the out-board are marked absent.

As an alternative to this, the workers may be required to take their respective discs from the out-board to their respective departments and place them on an attendance board. In this case, the gate attendance clerk records the attendance and absence on the basis of the position of discs on the out-board. The departmental attendance and late attendance are also recorded in the department concerned. The two records are compared by the internal audit or cost audit department. Thus, the record is checked regularly. Any discrepancy is reconciled.

In case of departure also the workers take the discs (which remain placed on the in-board) from the in-board and place them on the out-board.

This method is better than hand recording method, but is not free from defects. The defects are as below :

(a) One worker may take the disc of his friend, who is absent, along with his own disc and place it on the in-board unless there is strict supervision.

(b) There may be error in recording from the discs.

(c) Recording of attendance and departure, except during normal time of attendance and departure, shall require separate documents, for example, if a worker leaves the factory early, separate record of 'short leave' is to be prepared. Similarly, for overtime work, separate record is required. The records in question are 'short leave memo' and 'overtime memo' respectively.

Mechanical recording

(i) *Time clock method*

Every worker is allotted a Time Card (bearing his name, number, trade, grade, hourly pay and the name of his department) for each week. The cards meant for each clock are serially placed in out-rack beside the clock. There is an empty in-rack also. The workers know their clock numbers. They proceed in queues to the respective clock at the entrance. Each worker takes his card from the out-rack, puts it in the slot of the

clock and pushes the button, places the card in the in-rack and then enters the factory. The clock prints the time of punching on the card against the date. At the time of departure also, the same thing is done taking the card from the in-rack and finally placing it in the out-rack. At the end of the week the cards are used by the time office for calculating the hours of normal work, overtime work, short leave, absence etc. A fresh card is allotted for the ensuing week. Sometimes printing of late attendance, early or late departure are done in a different colour to facilitate recording.

Advantages :

(a) It is economical ultimately.

(b) The same card may be used for calculating wages and hence cost of preparation of pay rolls may be substantially reduced.

(c) The recording is reliable and hence the workers shall not have any suspicion.

(d) Frauds on attendance and departure cannot be committed.

Disadvantages :

(a) It involves heavy initial cost which small concerns cannot afford.

(b) One worker may punch more than one card unless done under strict supervision.

(ii) *Dial recording method* :

The recorder has a dial around which there are a number of holes, each hole representing a number which corresponds to the ticket number of the worker. Inside the recorder there is a roll of paper. As a worker enters, he presses the dial arm into the respective hole. His attendance is recorded automatically on the roll of paper against his ticket number.

The *advantages* are—ultimate economy, reliability of recording, avoidance of fraud. The *disadvantages* are—high initial cost and possibility of pressing for more than one by the same worker. Calculation of attendance period, from time of arrival and time of departure recorded separately, becomes difficult. The recording is also slow due to limited number of holes in the dial.

(iii) *Key recording method* :

Each worker is allotted a key bearing the ticket number of the worker. The worker inserts his key into the key hole and gives a turn. The ticket number and the clock time are automatically recorded on a sheet of paper provided in the recorder. The greatest advantage of key recording is that, the sheet of paper on which the ticket number and the clock time are recorded when taken out, forms a part of the Pay Roll. So the labour and expense for copying time record can be avoided. The number of holes and key is limited. Hence the recording becomes slow. The time of arrival and departure of a worker being recorded in two places of the sheet (not side by side) makes the calculation of attendance period difficult. This is another defect.

Calculation of attendance time

From the time of attendance and the time of departure (i.e., in-time and out-time) the period of attendance is worked out. According to rules, the normal hours and overtime hours are worked out separately from the period of attendance. The normal and overtime hours are recorded in separate columns of the clock card, because the two catagories of time are paid for at different rates. In order to avoid complications, attendance period may be recorded in multiples of 5, 10 or 15 minutes. Thus, attendance for less than 5, 10 or 15 minutes (as the case may be) is ignored although the clock recorder records time to minutes.

In case of disc/token/check system, if a worker enters and leaves at prescribed times his attendance is recorded for the full day. This can be known from his disc on the in-board and out-board. If he comes late or leaves earlier his disc shall be found in the late box and hence suitable adjustment shall be made with the full day hours for ascertaining the period of his attendance.

Specimen of a clock card

LINDWAL LTD. CLOCK CARD								
Name .. .. No								
Trade....... .. .. Department								
Grade . ... For week ending on .. .								
Hourly rate								
Day	in	out	in	out	Total Hours		output	Remarks
					normal	overtime		
MON. TUES. WED. THURS. FRI.								
			Total					
Total Wages					Received/Payment			
Less deductions........		Net Amount			Signature/Thumb Impression			

Features of good time keeping

In order to attain efficiency in time keeping, the following must be assured :

(a) Attendance and departure must be signified, by whatever means, strictly according to established procedure and under the supervision of a responsible officer physically present at the gate.

(b) Recording of attendance and departure by *proxy* must be completely eliminated.

(c) Workers, whether on time wage system or on piece wage system must record attendance and departure with equal importance.

(d) The machines used for recording must be in good number (so that there is no overcrowding at the gate) and in good condition (so that there is no error in recording).

(e) No worker should be allowed to leave the factory except on gate-pass duly signed by responsible officers. The gate-pass must record time of departure, so that adjustment in attendance period can be made on this basis.

(f) Late comers must record late attendance. The extent of late coming allowed should be prescribed. For example, late by over 30 minutes may be prescribed as disqualification for entry on the day or half.

(g) Double recording at the factory gate and in the department concerned, though more costly, gives facility for checking the time recorded.

<center>SECTION III</center>

WORKING TIME OR TIME BOOKED

Where a worker is engaged on direct wage (i.e., as a direct worker) it is necessary to record the time he spends on various jobs, or work orders, so that his wages for the time devoted to each job or work order can be debited directly to that job or work order. In case of a worker engaged in indirect work also, time spent on each kind of indirect work is to be recorded in order to facilitate debiting of his wage (in respect of time devoted to each kind of indirect work) to the respective overhead account (i.e., standing order no.).

Thus, in addition to recording of gate time (i.e., time of arrival and departure) time devoted by each worker to each job or indirect work must be recorded. This is *working time or time booked.*

Necessity of recording time booked

Recording of time booked is essential for the following purposes :

    (i) *To obtain the time devoted by a worker to different jobs or standing order numbers and also the time idly spent by him.* From the time of attendance and departure the period of attendance is ascertained. From the period of attendance if we deduct the total time devoted to different job or standing order numbers, we get the idle time. Sometimes the time during which no work could be provided for the worker is marked as idle time. In this case, time booked plus idle time shall be equal to the period of attendance obtained from the gate time.

    (ii) *To obtain the cost of work done.* The wages for the time booked to any job represent the labour cost of that job.

  (iii) *To obtain the overhead.* Wages paid to any indirect worker in respect of a standing order number form a part of the factory overhead. When overhead is recovered at a rate per direct labour hour, the time booked by direct workers to various jobs shall form the basis. In case of recovery of overhead at a rate per machine hour also, the recording of time booked is essential.

(iv) *To appraise of the labour efficiency.* **Actual time booked may be compared with the budgeted time or standard time to evaluate labour efficiency.**

(v) *To calculate the actual amount payable to a worker on any premium plan.* **Recording of time booked is essential, because in most cases, bonus depends upon the excess of time allowed over the actual time taken for any task.**

(vi) *To establish control.* **If the gate time exceeds the time booked plus idle time recorded, the difference is the time wasted between the factory gate and the department. Thus, recording of time booked and idle time and routine comparison of the same with the gate time enforces a moral check upon the workers.**

How to ensure efficient time booking

The following will ensure efficient time booking :

(a) Design suitable time sheets and ensure that such time sheets are correctly filled in. The persons in charge of work must understand the importance of correctly filling up of the time sheets.

(b) No idle time should be shown against any job. Idle time should be recorded in separate cards called idle time cards. In these cards the reasons of such idle time should be noted.

(c) Ensure that time sheets are not lost. They should be retained after completion.

Forms and records used for recording working time

The following forms and records are used for recording time booked :

1. Daily time sheet

In small factories which cannot afford to have card time recorder, a daily time sheet is allotted to each worker on which he enters daily the time spent by him on each job or standing order number during the day and submits the record to the foreman who countersigns it on verification.

This record is seldom used, because it involves frequent recording of time and hence heavy paper work. The record ensures accurate booking, because no worker attempts to record timings at the close of the day, but records the time spent on each job before he starts a new one. In factories where frequent change from job to job is required, daily time sheet is suitably used. The specimen of a daily time sheet is given below :

LINDWAL LTD.
DAILY TIME SHEET

Name of the worker ....
Clock No ....
Department ....
Trade... . ...   Date...............
                            Week No........

Work order No.	Standing order No.	Description of work	Timings		Total Hours		For Cost office	
			Start	Finish	Ordinary	Overtime	Rate	Amount

Certified

....   Ref..............
Signature or thumb   Signature of the foreman   Date............
impression of the worker

2. Weekly time sheet

The purpose of the weekly time sheet is the same as that of daily time sheet. Each worker is provided with a weekly time sheet for a week. In it, he records time spent by him on various jobs or standing order numbers during the week. If the worker attempts to record the timings at the end of the week from his memory, the records are likely to be inaccurate. If, however, he records the timings as soon as he completes his work on any job or standing order number, there is little chance of mistake.

Weekly time sheet involves less clerical work than the daily time sheet. It is suitable for intermittent jobs and, therefore, it is extensively used in contract costing, construction work, decorating work etc.

A specimen form of a weekly time sheet is given below :

LINDWAL LTD.
WEEKLY TIME SHEET

Name of the worker.........

Clock No. ....

Department.................

Trade.......................

Date...... ....

Week ending on. .....

Day	Work order No.	Standing order No.	Description of work	Timings		Total Hours		Cost office	
				Start	Finish	Ordinary	Overtime	Rate	Amount
Mon.									
Tues.									
Wed.									
Thurs.									
Fri.									
							Total		

....

Signature or thumb
impression of the worker

Certified

....

Signature of the foreman

Ref. ....

Date.... . ...

Regarding idle time recording, it may be pointed out that, whenever idle time arises, it has to be analysed into reasons and charged to the appropriate standing order number. Thus, the idle time may be recorded in the daily or weekly time sheet against the appropriate standing order number. As an alternative, a separate idle time card may be used for recording idle time daily or weekly. The specimen of an idle time card is as follows :

LINDWAL LTD.
IDLE TIME CARD

Name of the worker... ...
Clock No....................... ..
Department........ ....
Trade... ....

Date ....
Week No ....

| Reasons for idle time | Standing Order No. | Timings | | Hours | Cost office | |
		From	to		Rate	Amount
1. Machine breakdown						
2. Power failure						
3. Waiting—						
for instructions						
for materials						
for maintenance						
for tools						
4. Unfavourable climate						
5. Other reasons						

SD/- Worker...... ...   SD/- Foreman

Ref..............
Date..............

---

3. Job ticket or job card

For each joo or operation, a job ticket or a job card is provided. Whenever a worker is sent to work on a job or operation, he is given a job card bearing the job number. The worker records on it his starting time and finishing time either by hand or with the help of a clock recorder. As soon as he completes the work, he deposits the card which is then sent to Pay Roll Department after it is certified by the foreman. If the work is long and the worker has to suspend his work for lunch, personal needs etc., before the completion of the work, he must record the time of stopping the work and also that of resumption of work in the card so that actual time of work can be obtained from the card.

The job card system serves three distinct purposes—

(i) Whenever the job card is given to a worker, the worker gets proper authorisation for doing the work.

(ii) The job card records timings for 'start' and 'finish' and also the total hours of work done on the job and, as such, it helps ascertaining the amount of the charge to the job.

(iii) The job card establishes a close check on the time spent by a worker on each job.

However, the job card does not provide ready means for reconciling the time booked with the gate time. For that purpose a separate man-wise analysis is required.

A job card may be designed, in any way, to suit the needs of each individual factory. The following is the specimen of a simple job caid.

LINDWAL LTD.
JOB CARD/JOB TICKET

Work Order No............
Name of the worker......
Clock No.....................
Department.......... ....
Trade........................
Hourly rate ....

Drawing No.........

Sl. No......... ......
Date....................

Description of Job or operation	Timings		Hours	Quantity			Cost office	
	Start	Finish		Product	Accepted	Rejected	Rate	Amount
							Total	

Certified

....
Worker's Signature/Thumb Impression

....
Foreman's Signature

Ref...............
Date.............

4. Time cum job card

It has been pointed out that a job card can not provide ready means for reconciling the time booked with gate time and for that purpose separate man-wise analysis is required. To obviate this difficulty a combined Time and Job Card may be introduced. In this card the gate time as well as the working time shall be recorded by the worker with the help of clock recorder, usually. Since in the same card we get side by side the gate time and the working time, it becomes easy for us to reconcile the gate time with the time booked. Any discrepancy may be brought to light without delay. The specimen of a Time Cum Job Card is given below :

LINDWAL LTD.
TIME CUM JOB CARD

Name of the worker.........
Clock No ....
Department...............
Trade...............
Hourly rate......

Sl. No.....................
Date ....
Week ending on......

Day	Gate time		JOB No.	Work time		Hours		JOB Time	Idle Time	Cost office	
	In	Out		Start	Finish	Ordinary	Overtime			Rate	Amount
Mon. Tues. Wed. Thurs. Fri.											
				Total							

....
Signature

Total wages in words... . ...

Reconciliation of gate time with the time booked to jobs or standing order numbers

For effecting proper control on labour cost, particularly for minimising unproductive labour, it is necessary to reconcile the gate time of each worker during a period with his time booked to different jobs or standing order numbers during the same period. At least at the end of each week, or more frequently, the reconciliation should be done. If a worker works continuously, his gate time during a week (*i.e.*, his period of attendance during the week) should be equal to his time booked to different jobs or standing order numbers during the same week. If the former exceeds the latter, the difference represents idle time. Idle time is recorded in the job card (in a special column provided) or alternatively in a separate card called Idle Time Card.

The question as to whether above mentioned reconciliation is necessary in every system of costing, can be answered in a negative way. In *Process Costing*, since the workers are engaged on the same process throughout the period, booking of time in job cards is often not necessary. Thus, in the absence of time booked, reconciliation is not possible. In this case, gate time minus time lost due to breakdown, power failure, stoppage etc. is taken as the effective time to be booked to the process. In case of *job costing* also, when a worker is engaged on a particular work throughout the week no job card is to be prepared for him. His gate time less time lost, due to any reason, is taken as the time booked to that work. *In case of work that is completed over a long period*, for example, construction of bridge, roads, buildings etc., no job card is required. Only a statement showing the names and clock or ticket numbers of the workers is prepared and gate times are recorded.

Thus, where job cards are considered unnecessary and hence are not maintained, reconciliation between gate time and time booked is impossible.

Idle time

(Idle time represents the time of a worker for which wages are paid but no work is obtained against the payment. Some amount of idle time is inevitable in any industry inspite of efficient management, because men are not machines. The idle time cost offers a problem for control as far as possible, but not for total elimination.)

In our foregoing discussions, we have seen that idle time is detected in course of reconciliation of gate time with time booked and such idle time is recorded either in Job Card or in Idle Time Card.

Let us now examine the *causes of idle time.*

The causes of idle time may be classified under three heads : (i) *Productive causes* (ii) *Administrative causes* and (iii) *Economic causes.*

The productive causes include—(a) time wasted from factory gate to the department and return (b) time wasted between completion of one job

and beginning of the next job (c) time wasted for allotment of job to the workers of the shop (d) waiting for instruction, material, tools, maintenance work etc. (e) time wasted due to breakdown of mechinery, power failure, inspection, personal needs etc. (f) time wasted due to intermittent nature of work (g) time lost on account of disruption of work due to accidents etc.

The administrative causes include—(a) loss of time arising out of inefficient management, improper planning of labour utilization etc. (b) time wasted due to pen-down strike, go-slow etc. (c) wilful under utilization for any reason (d) loss of time arising out of lack of control.

The economic causes include—(a) loss of time due to non-availability of distributable work to sufficient extent (this happens mostly in seasonal industries) (b) idle time as a result of trade depression (i.e., production has to be lowered during depression and hence idle time must occur) (c) idle time due to shift of demand from one industry to another (for example, if the demand for black and white T.V. is shifted to that for colour T.V., production in the former industry must fall causing idle time).

Types of idle time

Idle time may be of the following types—(a) *Normal idle time* i.e., idle time which can not be avoided and which remains within the normal limit according to the nature of the industry.

(b) *Abnormal idle time* i.e., idle time which is not normal and which occurs due to some unexpected reasons. Thus, id'e time due to breakdown of machinery, long-time power failure or load-shedding, sudden strike or lock-out, closing of shops during natural calamities etc. are abnormal idle time.

From the point of view of *controllability*, idle time may be classified into—(a) *controllable idle time* and (b) *uncontrollable idle time*. Controllable idle time refers to that idle time, the cause of which can be controlled. For example, idle time due to waiting for instructions can be contiolled, if instructions are prepared in advance and given to the workers without delay.

Uncontrollable idle time refers to that idle time, the cause of which can not be controlled. For example, the extent of work during off-season in seasonal industries is naturally low. This situation can not be changed. Similarly, where the factory depends on outside supply of power, it must have idle time due to load-shedding, power utilization control etc.

It must be realised that uncontrollables are not as such for ever. For example, if the factory can install its own power house, it can avoid idle time due to load-shedding.

(*Treatments of idle time cost in Cost Accounts will be discussed later*)

Labour utilization

In engineering concerns the planning department sends intimation in advance to the foreman of each shop about the future workload. The

intimation is sent in the form of an *operation schedule* in which details of labour to be engaged on a particular work-order are mentioned. Suppose the work-order will pass from shop to shop for successive operations. Each shop, in that case, shall receive advance intimation regarding labour utilization relating to that shop. Thus, an operation schedule is similar to a bill of materials with only this difference that, while a bill of materials gives advance intimation regarding materials to be required for a work-order, an operation schedule gives advance intimation regarding labour operations required for a work-order.

Objectives that an operations schedule fulfils

The first objective is that, the shop-in-charge can plan the utilization of labour and machines well in advance on the basis of operations schedule.

The second objective is that, the shop-in-charge can estimate the extent of overtime work, man-hours shortage, man-hours in excess of requirement etc. and he can ask for more men or more work, or taking away of some of the existing staff.

The third and possibly the most important objective is that, an operation schedule would help controlling labour utilization. Job cards may be posted to the operations schedule so that actual labour utilization may be compared with the estimated labour utilization mentioned in the schedule to find out over or under utilization of labour for the work-order concerned. Unauthorised operation done, if any, can also be detected by the comparsion. Measures may be taken to minimise the over or under utilization of labour and to eliminate unauthorised operations.

Labour turnover

Labour turnover is defined as the ratio of the number of workers leaving an organisation during a given period to the average number of workers of that organisation during the same period. High labour turnover ratio indicates unstable workers due to any reason and the position is not desirable in any organisation. The following are the different ways of measuring labour turnover ratio.

1st Method :

Labour turnover ratio

$$= \frac{\text{No. of workers left during a period}}{\text{Average no. of workers on roll during that period}} \times 100$$

[*Note :* Average no. of workers $= \frac{1}{2}$ (No. at the beginning+No. at the end.)]

In an organisation having surplus workers the number of workers leaving is likely to be high. So, labour turnover ratio measured in the above way shall not reflect the true state of affairs, because workers might be very much willing to continue, but as they were surplus they had to go. This method is often called *separation method*, because 'workers left' means 'workers separated from the organisation'.

2nd Method :

Labour turnover ratio

$$= \frac{No.\ of\ workers\ replaced\ during\ a\ period}{Average\ no.\ of\ workers\ on\ roll\ during\ that\ period} \times 100$$

When surplus workers are retrenched the question of replacement does not arise. The workers whose services are required by the organisation are to be replaced by new appointments, if they leave. So, labour turnover ratio measured under this method shall reflect the true state of affairs, if the separations that required replacement could be properly replaced. In case of skilled workers leaving the organisation, problem arises regarding their replacement due to non-availability of skilled worker in sufficient number. Thus, the second method which is often referred to as *replacement method* gives reliable measurement, if the replacement required can be done.

3rd Method :

Labour turnover ratio

$$= \frac{No.\ of\ workers\ left + No.\ of\ workers\ replaced\ during\ a\ period}{Average\ no.\ of\ workers\ on\ roll\ during\ that\ period} \times 100$$

This method is a combination of the first and the second methods and is often referred to as *flux method.*

4th Method :

Labour turnover ratio

$$= \frac{No.\ of\ workers\ required\ to\ be\ replaced\ during\ a\ period}{Average\ no.\ of\ workers\ on\ roll\ during\ that\ period} \times 100$$

This method is an improvement of the second method by substituting "No. of workers replaced" by "No. of workers required to be replaced". Where replacement can not be made due to non-availability of the desired type of workers, the fourth method shall give the accurate measurement of labour turnover ratio.

Causes of labour turnover

The following are the principal causes of labour turnover arranged under two heads : (1) avoidable causes and (ii) unavoidable causes.

Avoidable causes :

(a) Bad working conditions (b) Lack of job satisfaction (c) Inadequacy of welfare measures (d) Lack of scope for training and promotion (e) Long hours of work (f) Lack of facilities for recreation, children's education etc. (g) Management's inhumane attitude (h) Lack of understanding amongst the workers etc.

Unavoidable causes :

(a) Unhealthy atmosphere of the locality (b) Social unrest (c) Retirement and death (d) Leaving on a better chance (e) Retrenchment during off-season in case of seasonal industries (f) Disablement due to disease or accident inside or outside (g) Marriage of female workers (h) Change of place due to political reasons or on the ground of health etc.

Effect of Labour turnover

The fundamental effect of high labour turnover is high cost. Let us explain. The workers who are efficient can find place elsewhere. So, being dissatisfied with organisation if the efficient workers leave, they shall be replaced by a set of new workers who can not be expected to give the same output as the outgoing workers, from the very beginning of their employment. Thus, the output shall fall resulting into higher cost. Even if the labour turnover is low, it can not be said that the cost of production shall be low. Let us explain this also. If the average workers in an organisation do not have standard efficiency, they will not be able to secure jobs elsewhere. As such, they will not move, leaving the labour turnover low. Since the workers themselves are below standard, they cannot give standard output. They create more scraps and the result is high cost.

Frequent changes in staff normally affect output and increase cost.

Cost of labour turnover

The costs of labour turnover may be classified into (a) *preventive costs*, (b) *replacement costs*. As the names imply, the former costs represent those costs which being incurred the leaving of the workers can be prevented and the latter costs refer to the costs that have to be incurred in connection with the replacement of the workers who left. The following is the list :

Preventive costs	*Replacement costs*
1. Costs of providing better medical facilities, better housing facilities, better educational facilities, better recreation etc.	1. Cost of advertisement, selection and recruitment.
2. Cost of providing credit societies, retirement benefits, incentives, accident compensation etc.	2. Cost of training new workers.
3. Cost of providing better working conditions and better safety measures.	3. Loss of working hours and materials in course of training.
4. Cost of maintaining better industrial relations and peace.	4. Cost of scraps, defectives etc. created by the new workers.
5. Cost of providing for promotion, training etc.	5. Cost of repair etc. of machinery in course of training.
	6. Compensation payable to workers on training, should they meet accident.

Work study

For improving productivity and for providing a basis for incentive plans for payment for wages, *work study* is an analytical tool. Work study aims at improvement of performance within an operation through reduction in material usage, time saving, quality improvement etc. In order to fulfil the objectives two related techniques namely *Method study* and *Time study* (i.e., work measurement) have been combined *into work study.*

Method study is a systematic procedure for analysing the work in order to eliminate unnecessary operations and to arrange the essential operations in the best possible order and thereby to standardise the working method. To achieve these objectives, the method study shall have the following steps :

 (i) Take the details of the existing method of work.

 (ii) Make detailed analysis of the existing methods of work and also of the alternative methods.

 (iii) Eliminate the unnecessary operations and movements and arrange the essential ones in the best order, keeping in view the simplification of work and better utilization of the facilities available.

Elimination of unnecessary operations and movements requires *motion study*. Thus, work study includes motion study also. In course of motion study, the most scientific and simple way of performing a work is established by eliminating the unnecessary and wasteful movements and thereby reducing fatigue.

Time study refers to the procedure of fixing standard time for performing a work or operation. Standard time is fixed by the following steps :

 (a) The entire job or operation is broken into constituent elements.

 (b) The time taken by a qualified average worker to perform each element under normal conditions, is measured by instruments like, stop watch etc.

 (c) Give due allowance to the above time for each element for fatigue, personal needs, interference etc. and also give allowance for incentive.

 (d) The total time obtained in 'c' (i.e., after giving allowances) represent the standard time to be allowed for the job or operation.

Job evaluation

Job evaluation means the systematic analysis and classification of a job according to the varying factors it demands from the workers.

Jobs are of different types. A group of jobs requires physical strength ; a second group requires brain ; a third group requires education, skill and experience ; a fourth group may require brain, education, skill and experience and so on. Job evaluation, in other words, classifies jobs into different grades according to their main characteristics in order to determine the merit of each job in terms of work value.

Procedure for job evaluation

Under the *points value method*, evaluation is done in the following manner.

 (a) Each job factor is allotted a number of points.

 (b) Consider the factors required for performing a job.

(c) Give the allotted points to the respective factors required by the job.

(d) The total of the points secured by the job decides its rank.

If the points scored by a job is higher than that scored by another job, the rank of the former is higher than that of the latter. Two jobs of completely different character may have the same rank, if each of them secures the same number of points.

It must be noted that, job evaluation is connected with the rating of the jobs on the basis of their characteristics. It must not be confused with the rating of the workers who perform the job.

[*Note* : Job factors mean the factors like skill, responsibility, experience, efforts, working conditions etc. required for performing a job.]

The other two methods of job evaluation are --*Grading method* and *Ranking method*.

Under the *Grading method*, a number of grades like, 'unskilled', 'semi-skilled', 'highly skilled', 'supervisory', 'administrative' are fixed in order of importance. Each job is reviewed and placed in one of the grades according to requirements. Pay scales for each grade is also fixed by committee formed for the purpose.

Under *Ranking method*, jobs are graded according to requirements and responsibility, from below upward. Each job is valued in terms of other jobs and a wage rate is fixed for it on the basis of the rates of wages prevailing in the locality.

Advantages of job evaluation

(a) It helps fixing proper wage for the proper job.

(b) It facilitates selection, training and promotion of workers.

(c) Anomalies in pay-structure can be detected by a scatter diagram putting actual wages against points secured by different jobs.

(d) Workers get justice in respect of wage rates fixed on the basis of job evaluation.

(e) It helps management in respect of allocation of personnel to different jobs.

Merit rating

Merit rating refers to evaluation of the individual merits of the employees. Job evaluation means the systematic analysis and classification of jobs according to their characteristics, and merit rating means the evaluation of the merits of the workers and their classification on that basis.

Merit rating is done by keeping the performance records of every worker and assessing the performances in terms of some norms or standards. The *objects of merit rating* are—(i) to assess the standard of performance of each individual worker, (ii) to provide a basis for rewarding for high merit without applying detailed work study, (iii) to provide a basis for remunerating the indirect workers whose performance can not be easily measured,

(iv) to choose suitable worker for job (Job evaluation mentions what a job requires of a worker. Merit rating mentions what qualities a worker possesses. If these two fit in each other the selection is perfect), (v) to provide a basis for promotion, increment etc., (vi) to find out the defects and abilities of each worker, (vii) to improve labour relations and reduce labour turnover.

The limitations of merit rating are — (i) Wrong rating may lead to labour unrest. (ii) Factors considered for merit rating may not be relevant. (iii) Rating may be influenced by previous records of an employee and thereby justice may be lost. (iv) Rating may be opposed by the employees or it may not be taken in recognition. (v) Incentives allowed on the basis of merit rating may not satisfy the workers.

The following factors are usually examined in the employee for merit rating purpose :

Attendance, co-operation, discipline, knowledge, skill, experience, aptitude, reliability, sense of responsibility and judgment, initiative, quantity and quality of output etc.

SECTION IV

WORKERS' REMUNERATION

Wages are the remuneration for labour, as rent is the payment for the use of land and interest is the payment for use of capital. Workers put efforts and in exchange they get wages. Wages paid to direct or indirect workers are calculated on the basis of the scale of pay and other allowances prescribed in the terms of employment. This may be modified from time to time by terms of agreements between employees and the employer. In modern times no arbitrary scale of pay is fixed. The workers' wages are based on job evaluation, merit rating, incentive plans, profit sharing and labour contract.

Methods of remuneration are many in number, but they can be grouped under two heads —

(1) *remuneration on time basis* (2) *remuneration on result basis.* There are also various incentive schemes which may give monetary or non-monetary benefits to the workers.

Before discussing the various methods of remuneration and incentive plans, let us discuss the various factors which need consideration before selecting a remuneration method for an organisation.

Factors considered before selecting a method of remuneration

(a) *Easy understandability.* The remuneration method must be easily understood by an average worker, otherwise there may be misunderstanding and suspicion leading to labour unrest. Simple remuneration method involves less clerical cost in preparing wage bills and cost records.

(b) *Choice between quality and quantity.* If an organisation considers that quantity is much more important than quality, a method of remuneration

by result should be selected, because the workers' earning and output are directly related in this method. If, however, quality is considered much more important than quantity, a method of remuneration on the basis of time should be selected.

(c) *Effect on overhead*. The fixed overhead is spread over the units produced. So, higher the output lower is the incidence of fixed overhead per unit. A method of remuneration by result obviously reduces fixed overhead per unit, while in case of a method of remureration on the basis of time, the incidence of fixed overhead per unit is likely to be higher.

(d) *Satisfaction to workers*. The method of remuneration must satisfy the workers, otherwise there will be high labour turnover involving preventive and replacement cost of labour turnover. A method which creates satisfaction shall help to attract efficient workers from outside the organisation.

(e) *Conformity*. The method of remuneration selected must be in conformity with that used by similar organisations in similar sphere.

Features essential for a successful wage plan

A successful wage plan must have the following essential features :

(a) *Fairness*. A wage plan becomes fair to both employers and employees when it is based on scientific time and motion study.

(b) *Minimum wage guarantee*. Whether under legal compulsion or not, a minimum wage must be guaranteed to workers. This should be fairly above subsistence level of income.

(c) *Link between effort and remuneration*. Unless a link is established between the value of work done and the remuneration payable, it is bound to be unfair to either the worker or to the employer.

(d) *Satisfaction for the workers*. The wage plan must satisfy the workers and as a result there will be high morale and low labour turnover.

(e) *Conformity with legal provisions and trade agreements*. The wage plan must not violate any of the provisions of law relating to wage payment nor it should violate any trade agreement.

(f) *Work guarantee*. In case of payment by result, even if the rate is too high, the workers' earnings shall not be satisfactory unless there is continuous work available to them. In case of payment on time basis also, unless continuous work is available there will be too much payment for idle time causing heavy loss to the employer.

(g) *Restrictive provisions*. When under a wage plan a worker is paid on the basis of output, he is likely to go on producing as much as he can in order to maximise his earning. So, unless there is some provision which will restrict his output, there may be undesirably over-production, too much depreciation to workers' health, greater chances of breakdown and scraps and defectives, etc. So, if the piece rates are on diminishing scale so that after certain quantity of output the rate per unit decreases, the workers' output shall be restricted, because he will be discouraged after a certain quantity of output.

(h) *Cost of implementation.* The cost of implementation of the wage plan must be as low as possible.

(i) *Flexibility.* The wage plan must not be rigid. It should be flexible. If the situation changes, some change may have to be incorporated in the wage plan also. A rigid plan is never suitable for modification. A flexible plan can be modified without much disturbance.

High wage rate vs. low wage rate

The common belief that high wage rate means high labour cost and low wage rate means low labour cost, is not always true on the following grounds :

(a) High wage rate will attract more efficient workers who will give more output beyond proportion. As a result, labour cost per unit will be lowered. On the other hand, low wage rate will hold only the inefficient workers who can not give satisfactory output. As a result, labour cost per unit becomes higher.

(b) High wage rate shall keep labour turnover very low and shall not involve much of preventive and replacement labour turnover cost, while a low wage rate shall cause high labour turnover and shall involve much of preventive and replacement labour turnover cost.

(c) Since efficient workers are available on high wage rate only, the quality of work shall be much better than the quality obtained under low wage rate.

(d) Incidence of overhead per unit shall be lower in case of high wage rate than that in case of low wage rate, because under high wage rate the output will be higher than that under low wage rate.

METHODS OF REMUNERATION

1. Remuneration on time basis

Under this head there are different schemes—

(a) *Time rate system,* (b) *High wage plan,* (c) *Graduated time rate system* and (d) *Differential time rate system.*

Let us explain each of the above briefly.

(a) Time rate system—Under this system, a worker is paid on his attendance at a specified rate irrespective of his outturn. The rate specified may be in terms of hour, day, week or month. The rate is fixed after considering the existing rate in the area for similar employment. The rate may be fixed or it may be on a scale starting from the minimum and rising to the maximum through increments at different stages. Efficiency check up may be imposed at particular stage of the scale. The system is also known as day wage system, time work system, day work system, day rate system etc.

Time rate system is suitable in case of—
(i) Highly skilled workers
(ii) Unskilled workers and trainees

(iii) Work being beyond the control of the worker (suppose a worker works on a conveyor belt system. He can not do his work unless the belt brings the work to him by automatic movement).

(iv) Work being dependent on the output of the previous worker in the chain.

(v) Work being not measurable in terms of homogeneous units.

(vi) Work requiring close supervision.

(vii) Work being of high quality and precision.

Advantages of time rate system

(i) Wages can be easily calculated without much clerical effort.

(ii) Wages calculated can be verified by the workers from the specified rate and the gate time and hence there will be no suspicion.

(iii) Worker is assured of his wage for the period of attendance at the specified rate.

(iv) It is the most suitable method of protecting quality of work.

(v) Where the work can not be measured in terms of a measuring stick, time rate system is only applicable.

Disadvantages of time rate system

(i) From the point of view of the workers it can be said that, time rate system does not encourage efficiency. It treats all at par, creating dissatisfaction amongst the efficient workers who lose efficiency gradually. The workers do not get the scope for increasing income by giving more output. Idleness gradually develops in them.

(ii) From the point of view of the employer it can be said that, he has to pay for much idle time. Supervision cost rises, output falls, work schedule can not be maintained, cost exceeds estimates made on the basis of time rate, standard for labour can not be set, employer has to depend upon the workers for the desired quantum of production.

(iii) From the point of view of the nation it can be said that, the nation suffers from low rate of production, if time rate system is introduced.

(b) High wage plan

In this case the time rate is fixed at a level higher than the rate prevailing in the locality for a similar employment and correspondingly a high standard of efficiency and output is fixed for the worker. If any worker can not attain that level of efficiency, he is taken out of the scheme. It is obvious that, working conditions suitable for attaining the standard efficiency are assured by the employer. Where high quality of output and high productivity are the objectives, high wage plan is suitable. Output and efficiency must be capable of being measured.

Advantages

(i) The scheme is as simple as ordinary time rate.

(ii) It reduces supervision cost.

(iii) It provides incentives and attracts efficient workers.

(iv) It reduces labour cost and fixed overhead per unit of output through higher productivity.

(c) Graduated time rate

Under this scheme there are two elements in a worker's time rate—one element is *fixed* and is dependent upon the nature of the work (i.e., job requirements decide the fixed rate) and the other element is *variable* and is dependent upon the individual merit rating of the worker and the cost of living index. The aggregate of the two elements constitutes the composite time rate for the worker. (The aggregate is known as 'Measured day work' and hence the other name of the graduated time rate is measured day work.)

The method is complicated. For each individual worker in the same job there will be a separate rate. If any worker frequently moves from one job to another, his rate shall have to be revised on every movement. The workers will not easily understand the method and, as such, there may be suspicion. Imperfection in merit rating may cause anomaly in rates.

Owing to the above shortcomings, graduated time rate system is not much in use.

(d) Differential time rate

Under this system different time rates are fixed for different levels of efficiency. A percentage of efficiency is fixed upto which a worker gets normal time rate. If he crosses that percentage of efficiency his time rate shall increase step by step as illustrated below.

Let the normal hourly rate is Rs. 2. The percentage of efficiency upto which the normal hourly rate is applicable is 60. Let the multiplier of the hourly rate increases by 10 for each 5% increase in efficiency.

The following shall be the hourly rates at different levels of efficiency :

upto 60%	efficiency	Rs. $2 \times 1 = $ Rs. 2
above 60% and upto 65%	,,	Rs. $2 \times 1.10 = $ Rs. 2·20
above 65% and upto 70%	,,	Rs. $2 \times 1.20 = $ Rs. 2·40
above 70% and upto 75%	,,	Rs. $2 \times 1.30 = $ Rs. 2·60

and so on.........

Since the method links up efficiency and output with rate of wage, it is not a time rate method in the true sense of the term.

2. Remuneration on result basis

Any system of wage payment that makes wages directly related with the output may be regarded as a system of remuneration on result basis.

The advantages of remuneration on result basis :

(i) Payment is made in respect of the output only.

(ii) Efficient workers produce more and hence they earn more.

(iii) Workers try to earn more by producing more in their own interest and hence there is more production and less supervision cost.

(iv) No payment for idle time is required.

(v) Greater output reduces fixed overhead per unit.

(vi) It helps setting up of standards on the basis of careful time study.

(vii) Less efficient workers try to improve themselves at the instance of more efficient workers.

(viii) Workers get scope to enchance earning.

The disadvantages of remuneration on result basis

(i) Where output can not be measured in terms of homogeneous units, the method shall not be applicable.

(ii) Quality of work is likely to deteriorate.

(iii) There may be more scraps, defectives etc.

(iv) Speedy-production may create more chances of breakdown.

(v) Overwork during early life of worker brings about fatigue early.

(vi) Unless there is a guaranteed day rate, the worker gets nothing, if there is no work.

(vii) There may be much unrest, if continuous work can not be provided.

(viii) Production-cut is very difficult to implement.

(ix) Fixation of piece rate on scientific basis involves much initial cost.

Various systems of remuneration on result basis

(a) Straight piece rate

Under this system a straight rate per piece of output is fixed after careful time and motion study and taking into consideration the comparable time rate for the same class of workers. The rate may be fixed for a definite number of units instead of one unit. The worker gets wages equal to his output multiplied by the piece rate, irrespective of the time taken. The piece rate is fixed as below :

Let the comparable hourly rate of pay is Rs. 2·40 ; the time and motion study shows that, to produce a piece of work the standard time required is 70 minutes. The piece rate shall be—

$$\frac{\text{Rs. 2·40}}{\text{60 minutes}} \times 70 \text{ minutes or Rs. 2·80.}$$

Straight piece rate may be applicable to the work of an individual or to the work of a group of individuals. When a piece rate is prescribed for a work done by an individual, the system is known as *individual . piece work* and the worker's earning is obtained after multiplying the number of units produced by him (or number of similar operations done by him) by his piece rate.

When a piece rate is prescribed for a work done by a group of individuals, the system is known as *group piece work.* The earning of the group as a whole is obtained after multiplying the number of units produced by the group (or the number of similar operations done by the group) by the group piece rate. *The group earning is shared by the members of the*

group in proportion to their time wage for the time devoted by each member to the group piece work.

When the workers are paid on the basis of result under piece rate *the number of units produced* by each must be obtained from records for calculating gross wage. The number, on the basis of which wages are calculated, is obviously the number of units passed by inspection. Defective units are usually rectified by the workers without extra remuneration and after rectification such units are accepted.

For the purpose of obtaining the necessary information *piece work card* is used in respect of every worker working on individual piece rate basis or in respect of every group working on group piece rate basis. A specimen form of piece work card is given below :

LINDWAL LTD.
PIECE WORK CARD

Name of the worker........   No ....
Clock No ....   Date...............
Group...................... ....
Clock Nos......... . ...---

Description of work done	Units Produced	Units Accepted	Units Rejected	Reasons for Rejection	Cost office Rate Rs.	Cost office Amount Rs.	Time taken

.... Inspected .... ---
(Signature of the worker)   (Signature of the foreman)

Reference.....................
Date.......................

[*Note* : A piece work card should be used for every worker or group in respect of each type of work done.]

Matters to be considered for fixing piece rates

(a) Persons with technical knowledge and experience should be given the responsibility of fixing piece rates.

(b) Past records of similar work should be consulted.

(c) The time required to produce a unit by an average skilled worker should be considered.

(d) The workers should know the method of production and gain efficiency before the piece rate is fixed and introduced.

(e) Too high or too low a rate is always dangerous.

(f) Time and motion study should be undertaken, if possible, in order to eliminate superfluous motions and ascertain the time required for producing a unit or making an operation by an average workman.

(g) The *following precautions* should also be taken :

    (i) Inspection of work to eliminate defectives and to protect the standard of work.

    (ii) Supervision for minimising the wastage, defectives, spoilage, breakdown etc.

    (iii) Discipline in attendance and work so that bottle-neck in work-flow can be avoided.

    (iv) Piece rate should be attractive, yet not too high, so that it provides incentive to workers to increase output.

    (v) Defectives, as a rule, should be rectified by the workers without extra remuneration.

    (vi) Exploitation of some by the other members of the group in case of group piece rate (for example, one or more members may tactfully remain idle but share the earnings of the group) must be eliminated.

(b) Taylor's differential piece rate

This was introduced in the United States by F. W. Taylor, who is regarded as the father of scientific management.

In this system two different piece rates are fixed for each job. The lower rate, equivalent to 83% of the time rate, is applicable to workers working at less than 100% efficiency. The higher rate is applicable to workers working at and above 100% efficiency. The higher rate is fixed at 125% of time rate plus 50% of time rate in the form of incentive.

A standard time may be fixed for performing a standard task. The efficiency is worked out, in this case, as below :

$$\% \text{ Efficiency} = \frac{\text{Standard time}}{\text{Actual time taken}} \times 100$$

Alternatively, a standard output may be fixed during a standard time. The efficiency is measured, in this case, as below :

$$\% \text{ Efficiency} = \frac{\text{Actual output}}{\text{Standard output}} \times 100$$

Taylor did not guarantee any day wage. Since the lower rate is abnormally low the workers who can not attain 100% efficiency are penalised. The higher rate being very high, the efficient workers get very high reward.

(c) Merrick differential piece rate (or multiple piece rate system)

This is a modification of Taylor's differential piece rate system, made by Mr. Merrick. Where under Taylor's differential piece rate system workers attaining less than 100% efficiency are penalised, under Merrick system such punitive lower rate is not imposed upon them, and those who attained a certain percentage of efficiency or above are rewarded by higher differential rates. The rates are as below :

Upto 83⅓% efficiency	Normal rate is applicable.
Between 83⅓% to 100% efficiency	Normal rate plus 10% of normal rate is allowed.
Above 100% efficiency	Normal rate plus 30% of normal rate is allowed.

Under Merrick system also, day wage is not guaranteed. The efficient workers are encouraged and at the same time less efficient workers are not penalised. This system is also known as *multiple piece rate system.*

(d) Gantt task bonus system

Under this system day wages are guaranteed (unlike Taylor and Merrick systems). A high standard or task is set. A worker who does not attain the standard is paid at the *time rate,* but a worker who attains or exceeds the standard is paid at *high piece rate* which includes a bonus equal to 20% of the time rate or 20% of ordinary piece rate. Gantt task bonus system, therefore, requires fixation of time rate, piece rate and standard performance. This is, therefore, a combination of time wage and piece wage systems. Under Gantt task bonus system the labour cost per unit tends to diminish as the workers proceed towards the standard. At the point of standard efficiency the labour cost per unit slightly increases, but this cost is stabilised, because it does not increase further with the further increase in efficiency.

The above truth can be illustrated as below :

Let the output fixed per hour is 10 ; the hourly rate of the worker is 60 paise, ordinary piece rate is 10 paise and the standard is set at 80% efficiency. The earnings of the worker at different levels of output and labour cost per unit shall be as below :

Production in units	Percentage of efficiency	earnings Rs.		labour cost/unit Re.
5	50%	·60	(hourly rate)	·12
6	60%	,,	,,	·10
7	70%	,,	,,	·086
8 (standard)	80%	·96	(high piece rate)	·12
9	90%	1·08	,,	·12
10	100%	1·20	,,	·12
12	120%	1·44	,,	·12

(*Note* : high piece rate = 10 P × Units produced + 20% bonus on that)

(e) Emersion efficiency system

Under this system also, day wage is guaranteed, a standard time for a standard task is set or a standard output is set for a particular time allowed. The standard of efficiency is fixed at 66⅔% or 67%. The worker gets his day wage upto standard efficiency. If he crosses the standard efficiency level, he becomes entitled to bonus. The bonus is calculated as a percentage of the hourly rate. *As the efficiency level increases the bonus percentage also increases.* At 100% efficiency level the bonus percentage becomes 20. If the efficiency exceeds 100%, bonus increases by 1% for every 1% increase of efficiency above 100%.

Let the hourly rate is Rs. 2.

Output fixed for a 44-hour week—400 units

Bonus rate—

	Upto 67% efficiency		hourly rate	
Between	67% and 80%	,,	bonus	4%
,,	80% and 85%	,,	,,	6%
,,	85% and 90%	,,	,,	10%
,,	90% and 95%	,,	,,	15%
,,	95% and 100%	,,	,,	20%

The earning of a worker during the week at different levels of efficiency and labour cost per unit shall be as below :

Weekly output fixed	Weekly actual output	% efficiency	Bonus Percentage	Earnings Rs.	Labour Cost/unit Re.
	200	50%	—	88	·44
	250	62·5%	—	88	·35
	270	67·5%	4%	91·52	·34
	300	75%	4%	91·52	·34
	336	84%	6%	93·28	·27
	356	89 ½	10%	96·80	·27
	400	100%	20%	105·60	·26
	420	105%	(20+ 5=) 25%	110·00	·26
	440	110%	(20+10=) 30%	114·40	·26

Emersion plan encourages slow workers to improve. It also helps shifting from time wage to payment by result. It is, like Gantt task bonus scheme, a combination of time and piece rates. Under Emersion plan the efficiency is measured as below :

In case of output set for a period— $\dfrac{\text{Actual output}}{\text{Output fixed}} \times 100 =$ Efficiency percentage

In case of time fixed for a given task— $\dfrac{\text{Time fixed}}{\text{Actual time taken}} \times 100 =$ Efficiency percentage

(f) Premium bonus plans

There are various plans under which time wage and piece wage are combined in such a way as to provide incentives to workers to work better. Normally, under premium bonus plans the time is fixed for performing a specified work or a specified number of units is fixed for production during a given time. If the worker can save any time out of the time allowed or produce more than the output specified within the given time, he gets his normal earnings plus some extra remuneration called bonus.

In any industry where overhead expense is considerable, premium bonus plans are implemented in order to increase output so that overhead per unit diminishes.

The principal schemes of premium bonus are—

(1) *The Halsey scheme* and (2) *The Rowan scheme.*

(1) The Halsey scheme

This was introduced by Mr. F.A. Halsey of the U.S.A,

Under this scheme a standard time is specified for performing a job, operation or task. The hourly rate is fixed and guaranteed to the worker so that he may get the guaranteed time rate, even if he does not complete the job within the standard time specified. If, however, he can complete the job in less than the time specified, he becomes entitled to a bonus equal to his time wage for 50% of the time saved in addition to his time wage for the actual time worked. Let the standard time allowed for performing a task is 'x' hours, the hourly rate of wage is Rs. 'y' and the actual time taken is 'z' hours (being less than x hours), the remuneration of the worker shall be :

	Rs.
Normal wage for z hrs. @ Rs. y	yz
Bonus $\frac{1}{2}(x-z)y$	$\frac{1}{2}xy - \frac{1}{2}yz$
Total	$\frac{1}{2}xy + \frac{1}{2}yz$
	or, $\frac{1}{2}y(x+z)$

Therefore, the total earning is obtained by multiplying the sum of time allowed and time taken by half the hourly rate.

Advantages :

1. The worker does not find any difficulty in understanding the scheme and the calculation of his remuneration.

2. The slow workers are not penalised, because time wage is guaranteed ; but the more efficient workers are rewarded for their efficiency.

3. The bonus encourages the workers to save as much time as possible, because the higher the saving of time, the higher is the bonus.

4. The scheme enables the employer to get more output from the workers and as a result, the fixed overhead per unit diminishes.

5. The saving of time is shared equally by the employer and the employees.

Disadvantages :

1. Since the saving in time is shared by the employers and the employees, many employees' organisations do not like it. They argue that the saving is done by them, so the entire benefit should go to the workers.

2. The scheme offers less incentive to the workers as compared to other incentive plans.

3. Saving in the time depends not only upon the workers, but also upon the standard of tools, machinery, materials and working conditions. Unless the best of these can be assured, desired result can not be expected.

4. Since the workers shall try to save as much time as possible in order to maximise their bonus, there may be chances of more wastage, spoilage, defectives and breakdown of machinery. Greater supervision cost shall, therefore, be involved.

The Halsey-Weir scheme

Under the Halsey-Weir scheme a worker is entitled to bonus equal to his time wage for $33\frac{1}{3}$% (often 30%) of the time saved (instead of 50% in

case of the Halsey Scheme). Thus, basically there is no difference between the Halsey Scheme and the Halsey-Weir Scheme except the above. It was developed by Weir Ltd. of Glasgow by making a change of the proportion from 50% as in case of the Halsey plan to $33\frac{1}{3}$%. This is also known as $33\frac{1}{3} : 66\frac{2}{3}$ scheme.

(2) The Rowan Scheme

The scheme was introduced by David Rowan of Glasgow (U.S.A.). The scheme provides for guarantee of the time wage as in the case of Halsey Scheme. A standard time is fixed for performing a job, operation or task exactly in the same manner as in the case of Halsey Scheme. The worker gets his time wages for the hours of his actual work. On this point also it does not differ from the Halsey Scheme. If the worker can complete the job in less than the time allowed, his bonus becomes equal to his *time wage for that proportion of the time taken as the time saved bears to the time allowed*. In other words, the ratio between bonus hours and the time saved is equal to the ratio between the time taken and the time allowed.

i.e.,
$$\frac{\text{Bonus Hours}}{\text{Time Saved}} = \frac{\text{Time taken}}{\text{Time allowed}} .$$

or Bonus Hours : Time Saved : : Time taken Time allowed).

Let time allowed is 'x' hours, time taken is 'z' hours and the hourly rate is Rs. 'y'. The earning shall be as below :

	Rs.
Normal wage for 'z' hours @ Rs. y	yz
Bonus Rs. $y \times \dfrac{x-z}{x} \times z$	$\dfrac{1}{x}\left(xyz - yz^2\right)$
Total	$2yz - \dfrac{yz^2}{x}$

Let the time allowed is 75 hours (i.e., x), time taken is 60 hours (i.e., z) and the hourly rate is Rs. 3 (i.e., y). The earning is as below :

	Rs.
Normal wage for 60 hours (60×3)	180
Bonus Rs. $3 \times \dfrac{(75-60)}{75} \times 60$	36
Total	216

Alternatively, Earning $= 2yz - \dfrac{yz^x}{x}$ $= 2 \times 3 \times 60 - \dfrac{3 \times 3600}{75}$

$= 360 - 144$ or Rs. 216.

Advantages :

1. Since the premium is proportionate to the time saved, the effect of wrong rate-fixing shall be less serious. So, from the point of view of the employer the Rowan scheme is safer than the Halsey plan.

2. It is seen that when a worker saves 50% of the time allowed his position is most advantageous, because if he saves any more time his earning per hour shall increase at a diminishing rate. Thus, there is a

limit to speed as a result of which there will be less chances of wastage, defectives, breakdown etc.

3. Due to higher output, fixed overhead per unit shall be lower.

4. Since the time saved is enjoyed by both employer and employee (though not in the same proportion as in the Halsey Scheme) the labour cost also diminishes to some extent.

5. The employee gets better wage. Their improvement in efficiency is rewarded.

Disadvantages :

1. Since the workers save time, they do not like the idea of sharing the saving by both employer and employees.

2. *In no case the bonus hours exceed 25% of the time allowed.*

3. Saving of time does not depend upon the workers' efficiency only. It depends upon the standard of tools, implements and materials and also upon the working conditions. Unless the best of these are assured, no useful purpose shall be served.

The Halsey and Rowan Schemes Compared

The following are the points of *similarity* and *dissimilarity* between the two schemes :

Points of similarity :

(a) In both the schemes the time rate is guaranteed.

(b) Standard time for completing a job or operation is fixed in both the schemes.

(c) Bonus is dependent upon the time saved out of the standard time allowed.

(d) The employer and employee share the benefits of saving in time.

(e) Both the schemes provide for higher output and hence lower rate of overhead per unit.

(f) Bonus hours are the same in both the schemes when a worker takes half of the time allowed to complete the job.

Points of dissimilarity :

(a) The Rowan Scheme provides better bonus than the Halsey Scheme, if the time saved is less than half of the time allowed. On the other hand, the Halsey Scheme provides better bonus than the Rowan Scheme if the time saved is more than half of the time allowed.

(b) Under Halsey Scheme, bonus hours are equal to 50% (normally) of the time saved, whereas the bonus hours, under the Rowan Scheme, are that proportion of the time taken as the time saved bears to the time allowed.

(c) Under the Halsey Scheme, higher the time saved higher is the bonus ; but under the Rowan Scheme, this is not true, if the worker saves more than half of the time allowed. Thus, the chances of scraps, spoilage, defectives and breakdown are higher under the Halsey Scheme than under the Rowan Scheme.

The following chart shows the difference in bonus earning and total earning under Halsey Scheme and the Rowan Scheme :

Time Allowed	Time taken	Hourly Rate	Bonus		Total earning		Earning per hour	
			Halsey Rs.	Rowan Rs.	Halsey Rs.	Rowan Rs.	Halsey Rs.	Rowan Rs.
20 hours	20 hrs.	Rs. 4	—	—	80·00	80·00	4·00	4·00
	15 hrs.		10·00	15·00	70·00	75·00	4·67	5·00
	10 hrs.		20·00	20·00	60·00	60·00	6·00	6·00
	8 hrs.		24·00	19·20	56·00	51·20	7·00	6·40
	6 hrs.		28·00	16·80	52·00	40·80	8·67	6·80
	4 hrs.		32·00	12·80	48·00	28·80	12·00	7·20

[*Note :*   There are other premium bonus schemes also, viz.,

(a) *Barth scheme*, where the time wage is not guaranteed i.e., the worker does not get wage on the basis of time worked. His wages are obtained dy multiplying the square root of the product of time allowed and time taken by the hourly rate i.e.,

Wages = Hourly rate × $\sqrt{\text{Time Allowed} \times \text{Time taken}}$.

Under Barth scheme, the rate of increase in the total earnings falls with the increase in efficiency. The ordinary workers do not understand the calculation of wages. Still the scheme is favoured by the beginners and the unskilled workers.

(b) *Accelerating Premium Bonus*, under which there is no generally accepted formula. Each individual employer makes his own formula. However the graph of $y = ·8x^2$ may be mentioned for a general idea of the scheme, where x stands for efficiency and y stands for wages.

If	x	is	1	or	1·5	or	2

$y = ·8x^2$ will be   ·80 or $·8 \times (1·5)^2$ or $·8 \times (2)^2$

i.e.,   ·80 or 1·80   or 3·20.

In words, the above represents the fact that at 100% efficiency, earnings shall be 80% of the basic wages ; at 150% efficiency, earnings will be 180% of the basic wages and at 200% efficiency, the earnings will be 320% of the basic wages.]

GROUP BONUS PLANS

The above premium bonus plans aim at creating the basis for calculation of wage and bonus payable to individual workers. Thus, the above plans are applicable where the performance of an individual worker is measurable. There are situations where the performance of a group of workers, instead of an individual worker, is only measurable or is to be only measured. The situations are as stated below :

(a) When it is not possible to measure the performance of individual worker, although the performance of the group as a whole can be measured.

(b) When it is desired to measure the performance of a group as a whole, instead of individual performances, in order to create collective spirit of work amongst the workers.

(c) The nature of the work is such that, excepting for a group of persons of different skill, it is not possible to execute.

In the above situations *group bonus schemes* are to be introduced.

So far as the *advantages* of the group bonus schemes are concerned, it may be said that it is capable of achieving :

(i) development of team spirit, (ii) increased output, (iii) better quality of work, (iv) minimisation of wastage etc., (v) automatic training (i.e., a helper may learn the work continuously and ultimately become a mason) etc.

The *disadvantages* of group bonus schemes are :

(i) Irrespective of the comparative efficiency of the workers in a group, the bonus earned by the group (only due to more efficient workers) is shared by all.

(ii) Too many cooks may spoil the broth, unless the sphere of activities of each in the group is clearly defined.

(iii) Evasion of responsibility often becomes a chronic disease amongst the members of the group.

(iv) It is difficult to fix the amount of bonus and ascertain the basis of its distribution amongst the members.

The group bonus scheme may be extended to the entire factory. The *important group bonus schemes are briefly discussed below* :

(a) Priestman's Production Bonus scheme

This scheme fixes a standard performance in terms of output or point. If the workers can account for better performance by producing output above the standard output or by securing points more than the standard points, they, as a whole, become entitled to bonus. According to the scheme, bonus is paid on the basis of the ratio of excess performance to standard performance. Let the standard output is 4,000 units and the actual output is 5,000 units, bonus is $\left(\frac{1,000}{4,000} \times 100 \text{ or }\right)$ 25% of the wages of the members. It is obvious that time wage is guaranteed. Thus, this scheme can be extended to the entire factory where there is mass production of standard articles with continuous flow of work.

(b) Rucker plan

Under this plan the change in market value due to alteration in the form, location of product and availability of a product or service (excluding the cost of materials or services which are bought) is termed *added value*. The ratio of *earnings* and *added value* is ascertained. Any reduction in this ratio increases the wage proportionately. The scheme requires constant negotiation between employers and employees for successful implementation. Rucker plan is known as *share of production plan*.

(c) Scanlon plan

This is similar to Rucker plan except that, in case of Scanlon plan the ratio between *earnings* and *selling price of production* is taken as the basis instead of the ratio between *earnings* and *added value* considered in case of Rucker plan.

(d) Towne gain sharing plan

Under this plan standard labour cost is set. Any reduction in the labour cost as compared to the standard labour cost qualifies the workers

to receive bonus in addition to wages earned. Bonus is equal to 50% of the *saving* in labour cost. The bonus is paid to the workers on *prorata* basis. The supervisory staff may also be admitted to bonus under this plan.

BONUS FOR INDIRECT WORKERS

In the above bonus plans (individual or group bonus) it has been observed that a standard performance is set and the actual performance being better than the standard performance, the workers are given bonus. Thus, *performance must be capable of being measured*. This is possible in case of a direct worker or in case of a department producing goods. What is the matter with an indirect worker or a department only rendering services to production departments ? Should there be no system of bonus only because their performance can not be measured ? The answer is, and should be, that they should also receive bonus although it is difficult to measure their performance. The *reasons behind this answer are* :

(a) Indirect workers may also be efficient and such efficiency should be rewarded.

(b) If the indirect workers are not given bonus, the discrimination shall reduce the morale of the indirect workers, and hence their efficiency.

(c) But for the assistance of the indirect workers, the direct workers can not efficiently produce the output. If indirect workers are deprived of bonus, the work of the direct workers must suffer.

(d) The trade unions shall start agitation, if a section of workers can not enjoy the benefit which another section enjoys.

For the purpose of introduction of a bonus scheme for the indirect workers, the staff in the indirect category should be classified into two as below :

(1) *Indirect workers whose work is connected with direct workers.* Under this head will come inspectors, checkers, internal transport-men, shop clerks etc. Bonus may be paid to them on the basis of output or performance of the direct workers.

(2) *Indirect workers who render general service.* Under this head will come the maintenance staff, canteen staff, dispensing staff, general sweepers, watch and ward staff etc. Bonus payable to them may be based, on the output of a department or of the entire factory, on the percentage of bonus payable to direct workers, on job evaluation, merit rating etc. If bonus is not paid, high time rates may be allowed to them in lieu of bonus.

Bonus to indirect workers should be—

(i) paid at a regular interval, say, weekly or monthly ;

(ii) assured for a financial year ;

(iii) related to efficiency ;

(iv) so organised as to produce benefit for both workers and employers ;

(v) so as not to show any gross discrimination between different classes of workers.

Keeping in view the above considerations, *a few examples* of the possible mode of payment of bonus to indirect workers are given below :

(a) *Bonus to stores staff* :

Stores staff are connected with the receipts and *issues of materials.* Their bonus may be based on the value of material handled or on the number of requisitions served. Standard may be set and the efficiency percentage, as below, may be worked out and related to bonus.

$$\text{Efficiency percentage} = \frac{\text{Actual performance}}{\text{Standard performance}} \times 100.$$

(b) *Bonus to repairs and maintenance staff* :

A group bonus scheme is suitable in this case, because, for repair and maintenance, services of a group is required. The number of complaints during a period may be estimated or standardised. Bonus may be paid on the basis of *reduction* in the number of complaints as compared to the number estimated, or on the basis of percentage efficiency (in case of standards).

(c) *Bonus to clerical staff* :

Where the output is measurable (for example, number of invoices made, number of standard letters typed, number of cheques issued, etc.), bonus may be based on the output in excess of a predetermined output. Promotion from lower category to upper category, as a rule, also provides incentive. Where output can not be measured, bonus may be paid under a group bonus scheme upon a planned schedule.

(d) *Bonus to supervisors and foremen*

Monthly bonus may be paid to supervisors and foremen on the basis of one or more of the following :

 (i) Output of department in which they work ;

 (ii) Savings of time by direct workers under each supervisor or foreman ;

 (iii) Saving in expenditure as compared to budgeted expenditure ;

 (iv) Reduction in scraps and wastes as compared to estimated figures ;

 (v) Reduction in labour turnover as compared to estimated figure ;

 (vi) Reduction in idle time (due to lack of supervision) as compared to estimated idle time on this account, etc.

(e) *Bonus to top executives* :

Bonus may be paid monthly from funds created out of profit or out of saving in cost. The efficiency of the department with which the executive is connected should be considered for deciding upon the amount of bonus.

OTHER INCENTIVE SCHEMES

Incentives are not always given in the form of money. It may be provided in other forms as well. Thus, incentives may be classified into : (i) Direct monetary incentives, (ii) Indirect monetary incentives, and (iii) Non-monetary incentives.

The bonus plans discussed so long, provide direct monetary incen ives. *The indirect monetary incentive schemes and also some forms of non-monetary incentive schemes* are discussed hereunder to conclude the discussion on labour remuneration.

Indirect monetary incentive schemes

Under this head we take the privilege of discussing only *two schemes* which aim at giving the employees some extra remuneration *on the basis of the prosperity of the organisation.* These are—(a) *Co-partnership scheme* and (b) *Profit-sharing scheme.* These may be termed indirect monetary incentives, because the extra remuneration is not directly based on the efficiency of any individual, group or department.

(a) Co-partnership scheme

Under this scheme employees are given some shares in the company so that they can get share of profit. Such shares may or may not carry voting rights. These shares are called employees' shares. The employees may be either allowed to deal freely with such shares or there may be some restrictions imposed by the company on dealings in such shares. How the shares go to the employees ? The company may advance loans to the employees to enable them to purchase the company's shares. Or the company may issue employees' shares against any extra remuneration payable to them under some award or so. Co-partnership and profit-sharing schemes may be simultaneously introduced.

Merits of the scheme

    (i) It improves the sense of belonging to the organisation, amongst the workers.

    (ii) It improves morale of the workers.

    (iii) It induces the workers to produce more profit, a share of which they enjoy.

    (iv) The employees believe that wastage of the company means reduction in the share of their profit.

Demerits of the scheme

    (i) Efficient and inefficient workers are not distinguished, because payment of bonus is not based on performances.

    (ii) Employees may make doubt about the correctness of accounts since they have no access to them. This may lead to strikes, closure, unrest etc.

    (iii) Payments are delayed, because they are subject to finalisation of accounts.

    (iv) Efforts and rewards of an individual worker or of a group are not inter-related.

(b) Profit-sharing scheme

According to this scheme the workers get, in addition to their wage, a share of the profit of the organisation. Such share is, however, settled by

agreement between workers and employers beforehand. In India, on the recommendation of the Bonus Commission, *Payment of Bonus Act* was passed in 1965 prescribing the minimum and maximum bonus payable at 4% and 20% of salary respectively. The minimum has been afterwards raised from 4% to $8\frac{1}{3}$%.

Under profit-sharing scheme, the profits of the company are shared by the shareholders, the company and the employees.

All the advantages and disadvantages mentioned in connection with co-partnership scheme are equally applicable in case of profit-sharing scheme also.

Non-monetary incentive schemes

The non-monetary incentive schemes mostly relate to the working conditions and not to the job functions.

The objectives for which non-monetary incentives are provided are : (*i*) to offer better working conditions to the workers ; (*ii*) to build up physical and intellectual health of the workers ; (*iii*) to let the workers have a sense of security of life ; and (*iv*) to remove any kind of discontent amongst the workers.

There is quite a good number of forms of non-monetary incentives.

Some forms of non-monetary incentives

   (a) Housing facilities
   (b) Free or subsidised canteen facilities
   (c) Sports and recreational facilities
   (d) Leave travel concession (L.T.C.)
   (e) Free education for the workers and their children
   (f) Health and safety measures
   (g) Retirement benefit schemes
   (h) Sending for higher training etc.

PAY-ROLL OR WAGES SHEET

We have so long discussed the various methods of remuneration including the incentive schemes. This will not help us to know how to prepare the *pay-roll* or *wages sheet* showing how much wages each worker is entitled to get. Let us have some idea about this aspect of labour remuneration.

Organisation for preparing the pay-roll or wages sheet

There should be a separate department called *Pay-Roll Department* for preparing the pay-roll to help controlling labour cost and accounting for labour cost.

Pay-roll department will do the following :

   (a) Maintain the records of job classification of each department and the rate of each worker in the department.

(b) Record the time of each worker as per time card and/or record the output of each worker as per piece work card.

(c) Calculate the wages on the basis of time or on the basis of output as the case may be.

(d) Deduct from the gross wage the necessary deductions in order to show the net wage payable.

(e) Prepare the pay-roll or wages sheet for each department separately.

(f) Maintain for each worker a permanent pay-roll record.

(g) Provide internal check on preparation of pay-roll and payment of wages.

(h) Furnish all necessary information to the costing department

Preparation of pay-roll

Pay-roll is prepared weekly, fortnightly or monthly (according to the practice of the organisation) for each department separately. Wage for each worker is calculated as per his *time card* (or clock card), if he is paid on the basis of time, or as per his *piece-work card*, if he is paid on the basis of result. Wage on the basis of time is to be analysed into (a) wage for normal hours worked (b) wage for overtime hours worked and (c) wage for overtime premium hours, because, normally wage for normal hours and that for overtime hours are treated as direct wage and that for overtime premium hours is treated as overhead.

From the gross wage calculated above, deductions are to be made under different heads to show the net wage payable. Some of the authorised heads of deductions under the Payment of Wages Act, are as below ·

(a) House rent and payments for other amenities and services provided

(b) Advance taken by the workers

(c) Employees' contribution to E.S.I.

(d) Loans from co-operative credit societies

(e) Life Insurance premium under salary savings scheme

(f) Provident fund contribution

(g) Income-tax

(h) Others to be specified.

The pay-roll must be prepared without delay in order to facilitate the payment of wage within the time laid down by the Payment of Wages Act.

Procedure for payment of wages

After the completion of the preparation of the pay-rolls or wages sheets of all departments, *pay slips* are prepared in details for each worker. Each worker is given his pay slip in advance so that he can check the calculations before the payment is received.

The pay-roll (or the wage sheets) are then sent to the cashier who draws money from the bank and arranges payment. Usually, for each worker a packet containing his net wage is prepared and sealed after checking. Disbursement is made in the presence of a responsible officer of the

department where the worker works, and under the payees signature of thumb impression. If any worker remains absent on the payment date, his wage may be paid to a person authorised by him duly. If an absentee does not authorise any body to receive his wage, the amount shall be kept with the cashier after due entry in the *undisbursed wages book.*

Possible frauds in respect of payment of wages to be prevented

The following types of frauds may be committed and hence preventive measures are to be adopted :

(a) There may be ghost workers in the pay-roll.

(b) The working hours may be stated at a higher figure in the pay-roll than that appeared from the clock card (in case of time wage).

(c) The units produced may be stated at a higher figure in the pay-roll than that appeared from the piece work card (in case of payment by result).

(d) Higher rate of wage may be employed.

(e) Overtime wage, bonus etc. not due to the worker, may be included.

(f) Deliberate omission to make authorised deductions...etc.

When a worker knows that fraud has been committed in his favour, he does not take payment on the payment date, but takes it afterwards so that it can not be detected by others present at the spot.

The following steps should be taken to prevent frauds

(a) Payment should be made to all workers on the same day in the presence of the respective departmental heads.

(b) Clock time should be checked with time booked and idle time.

(c) Payment for overtime, idle time and for scrap and defective production should be duly authorised. The authorisation should be checked with such payment shown in the pay-roll.

(d) Rates should be verified from the schedule of rates.

(e) One person should not be allowed to work out the time from clock card (or output from the piece work card) and prepare the pay-roll.

(f) Deductions should be verified from the deduction lists.

(g) All calculations in the pay-roll should be checked by another person.

(h) While making the pay-packets, counting of notes, coins etc. should be checked by another person before they are sealed. They should put their signatures on the packets.

(i) Amount equal to the total net wages should be drawn from the bank.

(j) Payment to outworkers should be made by head office staff.

(k) Undisbursed wage should be recorded in the 'undisbursed wages book' and such wages should be paid on a particular day in the week after proper scrutiny of the person(s) and reasons for absence on the payment date.

The following is a specimen form of a pay-roll or wage sheet :

LINDWAL LTD
PAY-ROLL

Department/Cost Centre............   ....   Week ending on...............

Clock Number	Name	Total Hours	Normal Hours	Overtime Hours	Overtime Premium Hours	Rate Rs.	D.A. Rs.	Gross Wages Rs.	Deductions					Net Wages Rs.
									P.F. Account No.	P.F. Amount Rs.	I.T. Rs.	ESI Rs.	Loan Rs.	
Total														

<center>SECTION V</center>

LABOUR

ACCOUNTING FOR WAGES

It has been already stated in our earlier discussions that pay-rolls or wages sheets are prepared separately for each department or cost centre. The total (gross) of each wages sheet or pay-roll indicates the wages in respect of a department or cost centre for the particular wage period.

In case of *process costing* the cost centre represents the process and hence the wages of the cost centre constitute the labour cost of that process. Thus, in case of process costing analysis of wages is not necessary.

In the case of *job costing* it is necessary to arrange the time or piece records according to each job order or standing order. A *wages analysis* or *wages abstract* is used for the purpose of ascertaining the amounts of wages, of a wage period, chargeable to various Job Accounts and Overhead Accounts.

It must be remembered that, the wages chargeable to Job Accounts are direct wages and those chargeable to Overhead Accounts are indirect wages. The total of direct and indirect wages shown in the wages analysis for a wage period must be reconciled with the gross total wages as per pay-rolls or wages sheets of that wage period.

For the purpose of making analysis of wages the records used are—
Job cards, piece work cards, idle time cards, pay-rolls etc.

A simple form of wages analysis sheet or wages abstract is given below :

LINDWAL LTD.

Wages analysis (or wages abstract)

Date ....   No...... ....

Department	Total Wages Rs.	Work-in-Progress Rs.	Factory Overhead Rs.	Administration Overhead Rs.	Selling & Distribution Overhead Rs.	Net Wages Rs.	Deductions				
							P. F. Rs.	I.T. Rs.	ESI Rs.	Co-op. Loan Rs.	Others Rs.

It must be seen from the above that, the amount appearing in the column for "Work-in-Progress" indicates *direct wages chargeable to various job orders. So, there must be further analysis of the amount job numberwise.*

As an *alternative* to the above arrangement there may be two documents namely (1) *Wages Analysis Book* (exactly in the above form) to show the analysis of wages according to direct wages chargeable to Work-in-Progress A/cs and indirect wages chargeable to various Overhead A/cs and (2) *Wages Analysis Sheet* showing the direct wages according to different job numbers with a summary thereof.

The forms may be as below :

LINDWAL LTD.
Wages Analysis Sheet

No.............
Week No.............

Clock No.	JOB No. 351		JOB No. 453			JOB No. 399			JOB No. 277			SUMMARY			
	Hrs.	Amount Rs.	Clock No.	Hrs.	Amount Rs.	Clock No.	Hrs.	Amount Rs.	Clock No.	Hrs.	Amount Rs.	Job. Nos.	Hrs.	Amount Rs.	Cost Ledger Folio
												351			
												453			
												399			
												277			
Total															

Note : The total amount of the summary column appears in the wages analysis book in the Work-in-Progress column shown below :

LINDWAL LTD.
Wages Analysis Book

Date.............
No.......... ....

Department	Total wages Rs.	Work-in-Progress Rs.	Factory overhead Rs.	Administration overhead Rs.	Selling & Distribution overhead Rs.	Net Amount Rs.	DEDUCTIONS				
							P.F. Rs.	I.T. Rs.	ESI Rs.	Co-op. Loan Rs.	Others Rs.

Accounting entries

1. *For the total wages—*
   Wages Control A/c   Dr.
       To cost ledger control A/c

2. *For the total direct wages chargeable to various jobs—*
   Work-in-Progress control A/c   Dr.
       To wages control A/c

[*Note* : Amount chargeable to each individual job is posted to the respective Cost Sheet.]

3. *For total indirect wages chargeable to various overhead accounts—*
   Factory overhead control A/c   Dr.
   Administration Overhead Control A/c   Dr.
   Selling & Distribution overhead control A/c   Dr.
       To wages control A'c

TREATMENT OF SOME SPECIAL ITEMS

1. Idle time

(Idle time means the time for which wages are paid, but no work from the workers is obtained. Idle time cost refers to the wages paid for the idle time. Idle time should not be, normally, recorded in the job card, but it should be entered in a separate card called *Idle time card.*)

How idle time cost should be treated in cost accounts depends upon how idle time arises. So, before suggesting the treatment, the causes of idle time as stated below must be ascertained.

Causes of idle time

1. Time lost between the factory gate and the department ; idle time due to personal needs, tea breaks, tool setting, machine adjustments etc. ; idle time normally arising between finishing of one job and starting of the next job.

2. *Normal idle time for waiting* for jobs, instructions, materials, tools, power etc. and due to breakdown of machinery, adverse atmosphere etc.

3. *Abnormal idle time for prolonged period* arising out of reasons mentioned in (2) above and also due to strikes, lock-outs, natural calamity etc.

4. Idle time arising out of employment of workers in unnecessary work only to keep them engaged and also idle time arising out of employment of upper category workers in lower category work. These types of time apparently look like working time, but since loss of wage is involved they mean *idle time of concealed nature.*

Treatment in cost accounts

    (a) Idle time cost arising out of causes mentioned in (1) above is *treated by neglect* i.e., such idle time need not be recorded

separately, but they should be allowed to remain merged in the job orders or standing order numbers.

(b) Idle time cost arising out of the causes mentioned in (2) above i.e., *normal idle time cost* should be debited to factory overhead account.

(c) *Abnormal idle time cost* as mentioned in (3) above, should be charged to costing Profit & Loss A/c (i.e., not to be treated as an element of cost).

(d) *Concealed idle time cost* is to be treated as overhead or direct wage according to circumstances ; but since such idle time cost increases the cost per unit in an undesirable way, care must be taken to prevent them by suitable measures.

Control

Advance production planning, timely procurement of stores, proper maintenance of machinery and tools, advance planning for personnel and machine utilization, assuring supply of power from own power plant (wherever installed) etc. shall prevent or reduce considerably the idle time. Inspite of best efforts, idle time, for causes not within the control of the organisation, shall arise to some extent.

2. Overtime wage

The commonsense meaning of overtime is the time worked over the normal working hours in a day or week. The Factories Act (1948) of India and the Shop and Establishment Act fixed the usual working hours for workers and stated what constitutes overtime. According to Factories Act, 1948, any work beyond 9 hours in a day or beyond 48 hours in a week represents overtime work. The Act provides for payment of overtime work *at double the normal rate.* Even where the Act is not applicable, overtime work is paid at a rate higher than the normal rate of wage under agreement between the workers and the employer.

Overtime work is not a normal feature --It is undertaken under extraordinary circumstances and before it is undertaken it should be authorised by a responsible officer after carefully considering the causes for which it has been necessary and also the desirability of undertaking it ; because overtime work involves the *following disadvantages* :

(a) It involves excess labour cost, because it is paid at a higher rate.

(b) It gives less output, because workers are already exhausted by the end of the period of normal time work.

(c) It acts upon the health of the worker.

(d) The .workers tend to keep work pending for doing the same during overtime hours in order to earn extra income.

(e) If there is no rational distribution of overtime work amongst all the workers, there may be discontent in some section of the workers.

(f) It involves extra lighting cost in many cases.

(g) It causes more strain on the machinery due to continuous work for a long time.

(h) Overtime work once introduced can not be easily discontinued due to workers' resistance.

Inspite of the above disadvantages, overtime work has some *advantages* also, as mentioned below :

(a) More work is obtained from the same resources (i.e., men and machines, particularly where there is a shortage in the supply of suitable men and machines).

(b) Delay in production due to any reason can be favourably made up and thus delivery schedules can be maintained.

(c) Extra earning can be provided for the workers without extra cost to the organisation, if customers can be charged at higher rates.

(d) Market opportunity can be availed of.

(e) Materials of peculiar nature, which unless utilised quickly are subject to spoilage, can be saved. For example, cement concrete mixture has to be utilised quickly otherwise it will be unsuitable for use.

Treatment of overtime wage in cost accounts :

The treatment depends upon the circumstance in which it arises.

[It must be remembered that, overtime wage consists in two parts : (a) payment at normal rate, (b) payment at extra rate over the normal rate i.e., the overtime premium.]

1. Where overtime is caused due to general pressure of work, the payment at normal rate should be debited to the job order or standing order number on which the worker is employed and the premium should be debited to the overhead account of the department. As an alternative and where appropriate, a comprehensive rate may be worked out taking into consideration the estimated direct wages at normal rate and overtime premium and all jobs should be charged at that rate throughout the period.

2. Where the overtime work to be undertaken for executing customers' order, the total payment should be charged to that job or jobs as direct wage.

3. Where the overtime work has to be undertaken in a department due to delay of work in another department, the overtime premium should be charged to the department which caused delay.

4. When overtime work is undertaken by a seasonal industry to cope with busy season work, the overtime wages should be charged to general overhead or as an alternative, it may be debited to deffered Overhead A/c and should be absorbed by the production throughout the cycle.

5. When overtime work has to be undertaken in order to avail of a special opportunity of the market, the total payment should be charged to production as direct wage, because the market price receivable shall be high.

6. Overtime work undertaken due to abnormal conditions like major breakdown, prolonged power-cut, natural calamity etc., should not be

considered for cost accounts. The overtime wage, in that case, should be charged to Costing Profit & Loss A/c.

7. Where overtime work is to be undertaken in order to utilise the surplus *perishable* materials obtained from one job for utilisation in another job, the normal payment is to be debited to the job in which the material is utilised and the premium should be charged to the general overhead.

Control

Overtime work should be controlled effectively. The following steps should be taken :

(a) Enquire, why overtime work is necessary ? Who is responsible for creating such necessity ?

Is it due to lack of supervision, wrong planning, inefficiency of the workers or improper maintenance of the plant ? Is it due to acceptance of an order to be executed during overtime ? Is it due to any abnormal reason ?

(b) On the basis of the answer, determine the desirability of allowing overtime work. Specially authorise it under the signature of a responsible officer, if it is desired to be undertaken.

(c) Remove the causes which are within control so that necessity does not recur in future.

(d) If overtime work is going to be a permanent affair due to shortage of staff and/or machine, recruit extra men and instal new machines, if practicable.

WORKED-OUT PROBLEMS

Problem 1.

In a factory, workers are paid on a differential piece work system, the differentials applied are 80% piece rate below standard and 120% piece rate at or above standard. From the following particulars calculate daily earnings of the workers *A, B* and *C* :

    Standard production : 10 units per hour.

    Time rate : Re. 1·00 per hour.

    Production in a day of 9 hours :

      A—75 units ; *B*—90 units ; *C*—110 units.

Solution :

Standard production per hour 10 units and time rate per hour Re. 1·00.

∴ Normal piece rate : $\dfrac{\text{Re. } 1\cdot00}{10} = \text{Re. } 0\cdot10$

Low piece rate below standard : $\dfrac{80}{100} \times \text{Re. } 0\cdot10 = \text{Re. } 0\cdot08$

High piece rate at or above standard : $\dfrac{120}{100} \times \text{Re. } 0\cdot10 = \text{Rs. } 0\cdot12$

Standard production per day : $9 \times 10 = 90$ units

A will get low piece rate while *B* and *C* will get high piece rate.

Daily earnings—

A—75 units @ Re. 0·08 per unit = Rs. 6·00
B—90 ,, @ Re. 0·12 ,, ,, = Rs. 10·80
C—110 ,, @ Re. 0·12 ,, ,, = Rs. 13·20

Problem 2.

From the following particulars, calculate earnings under differential piece rate system, where basic piece rate is guaranteed below standard and the workers get 110% of basic piece rate between 100% and 120% efficiency and 120% of basic piece rate above 120% efficiency.

Standard production : 800 units per week of 48 hours. Basic piece rate : Re. 0·10 per unit.

Production for the week : A—720 units ; B—800 units ; C—880 units ; D—1,000 units.

Solution :

(*i*) *Percentage efficiency of individual worker –*

A — $\dfrac{720}{800} \times 100$ 90%

B — $\dfrac{800}{800} \times 100$ 100%

C — $\dfrac{880}{800} \times 100$ 110%

D — $\dfrac{1,000}{800} \times 100$ 125%

(*ii*) *Piece rate applicable to individual worker—*

A—$\dfrac{100}{100} \times$ Re. 0·10 = Re. 0·10 per unit (Guaranteed basic piece rate)

B—$\dfrac{110}{100} \times$ Re. 0·10 = Re. 0·11 per unit

C —$\dfrac{110}{100} \times$ Re. 0·10 = Re. 0·11 per unit

D—$\dfrac{120}{100} \times$ Re. 0·10 = Rs. 0·12 per unit

(*iii*) *Earnings per week—*

A—720 units @ Re. 0·10 per unit = Rs. 72·00
B—800 ,, @ Re. 0·11 ,, ,, = Rs. 88·00
C—880 ,, @ Re. 0·11 ,, ,, = Rs. 96·80
D—1,000 ,, @ Re. 0·12 ,, ,, = Rs. 120·00

Problem 3.

An organisation operates an individual premium bonus scheme in which an operative's performance is calculated and paid for as follows : Each task is given a target expressed in standard minutes. The quantity of weekly output achieved is stated in terms of total of standard minutes. The

weeks total of standard minutes is expressed as a percentage of attendance time (to the nearest whole number). The operator is paid :

Percentage performance	Rate paid per hour
0—75	Rs. 2·20
76—90	Rs. 2·40
91—110	Rs. 2·80
111 and over	Rs. 3·40

Three products are assembled and have the following standard times :

Product A—42 standard minutes
Product B—60 standard minutes
Product C—75 standard minutes

Required :

Calculate the gross pay for each operator from the following information :

Operator	Hours attended	Performance Products Assembled		
		A	B	C
P	38	15	13	11
Q	39	15	10	8
R	42	15	18	16

Solution :

(i) *Standard hours of actual output :*

Operator P
$15 \times 42 = 630$ minutes
$13 \times 60 = 780$ minutes
$11 \times 75 = 825$ minutes
$\underline{2235}$ minutes $\div 60 = 37 \cdot 25$ hours

Operator Q
$15 \times 42 = 630$ minutes
$10 \times 60 = 600$ minutes
$8 \times 75 = 600$ minutes
$\underline{1830}$ minutes $\div 60 = 30 \cdot 5$ hours

Operator R
$15 \times 42 = 630$ minutes
$18 \times 60 = 1,080$ minutes
$16 \times 75 = 1,200$ minutes
$\underline{2,910}$ minutes $\div 60 = 48 \cdot 5$ hours

(ii) *Standard hours expressed as a percentage of hours attended—*

Operator P $\dfrac{37 \cdot 25}{38} \times 100 = 98\%$ ∴ Rate applicable Rs. 2·80

Operator Q $\dfrac{30 \cdot 5}{39} \times 100 = 78\%$ Rs. 2·40

Operator R $\dfrac{48 \cdot 5}{42} \times 100 = 115\%$ Rs. 3·40

Statement of Gross Pay

Operator	Hours worked	Percentage performance	Rate Rs.	Gross Pay Rs.
P	38	98%	2·80	106·40
Q	39	78%	2·40	93·60
R	42	115%	3·40	142·80

Problem 4.

The following piece rate system is followed in a small concern manufacturing a single product :

   (i)   Basic piece rate upto 85% efficiency.

   (ii) 110% of basic piece rate between 85% and 100% efficiency.

   (iii) 120% of basic piece rate above 100% efficiency.

Guaranteed day rate is equal to 70% efficiency. Assuming that 100% efficiency is 100 pieces per day of 8 hours and the piece rate is 50 paise per piece, calculate labour cost per piece at 5% intervals between 60% and 120% efficiency. *(I. C. W. A. Inter.)*

Solution :

   Upto 70% efficiency, the guaranteed day rate applies and is 70 × Re. 0·50 = Rs. 35 per day.

   Above 70% and upto 85% efficiency, the basic piece rate applies and is Re. 0·50 per piece.

   Above 85% and upto 100% efficiency, the piece rate is high and is $\frac{110}{100}$ × Re. 0·50 = Re. 0·55 per piece.

   Above 100% efficiency, the high piece rate is—

   $\frac{120}{100}$ × Re. 0·50 = Re. 0·60 per piece.

Labour cost per piece at different efficiency levels

Efficiency ( )	60	65	70	75	80	85	90	95	100	105	110	115	120
Labour cost per piece (Re.)	0·583	0·538	0·50	0·50	0·50	0·50	0·55	0·55	0·55	0·60	0·60	0·60	0·60

Notes : $\frac{^1 Rs.\ 35}{60}$ = Re. 0·583 ; $\frac{^2 Rs.\ 35}{65}$ = Re. 0·538.

Problem 5.

Bharat Garment Corporation produces garments of the same size and style. Employees are paid wages at Rs. 2·50 per hour for an eight hour shift. They produce five units per hour per employee. The overhead in this department is Rs. 3 per direct labour hour. The employee and the management are considering the following piece rate wage proposal.

Upto 45 units per day of 8 hours, 50 paise per unit. From 46 units to 50 units 53 paise per unit, from 51 units to 55 units 55 paise per unit, from 56 units to 60 units 57½ paise per unit. Above 60 units 60 paise per unit. The working hours are restricted to 8 hours per day. Overhead rate does not change with the increased production. Prepare a statement indicating the advantage to the employee as well as to the management at production levels of 40, 45, 50, 55, 60 and 65 units per worker per shift.

(*I. C. W. A. Inter.—Adapted*)

Solution :

Calculation of present conversion cost :

	Rs.
Wages per hour	2·50
Overhead charges per labour hour	3·00
Conversion cost per hour	5·50
Output per hour	5 units
Conversion cost per unit Rs. 5·50 ÷ 5	Rs. 1·10

Statement showing saving to Management

Units	Piece Rate Re.	Piece Wages Rs.	Overhead Rs.	Total Cost Rs.	Existing Cost Rs.	Saving Rs.
40	0·50	20·00	24·00	44·00	44·00	Nil
45	0·50	22·50	24·00	46·50	49·50	3·00
50	0·53	26·50	24·00	50·50	55·00	4·50
55	0·55	30·25	24·00	54·25	60·50	6·25
60	0·575	34·50	24·00	58·50	66·00	7·50
65	0·60	39·00	24·00	63·00	71·50	8·50

Statement showing advantage to Employee

Units produced	40	45	50	55	60	65
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs
Time wages (per day)	20·00	20·00	20·00	20·00	20·00	20·00
Piece wages	20·00	22·50	26·50	30·25	34·50	39·00
Gains	Nil	2·50	6·50	10·25	14·50	19·00

When daily output is 45 units, employer saves Rs. 3, while employee gains Rs. 2·50. When daily output is 50 units, employer saves Rs. 4·50 and employee gains Rs. 6·50. As daily output increases further, employees' gains increase more rapidly than the employer's savings. This is due to the following reasons :

(1) Earning of employee increases due to increase in production and also due to rise in piece rate.

(2) Saving of employer arises only from distribution of overhead over larger output, but such saving is partly off-set by increase in labour cost resulting from the introduction of piece rate.

Problem 6.

From the following data calculate the total monthly remun
each of the three workers *A, B* and *C* :

    (i)   Standard production per month per worker 1,000 units.

    (ii) Actual production during a month : *A*—850 units, *B*—720 units, *C*—960 units.

    (iii) Piece work rate per unit of actual production 20 paise.

    (iv) Dearness wages—Rs. 50 per month (fixed).

    (v) House rent allowance—Rs. 20 per month (fixed).

    (vi) Tiffin allowance—Rs. 20 per month (fixed).

    (vii) Additional production bonus at the rate of Rs. 5 for each percentage of actual production exceeding 80 per cent of the standard.   *(C. U., B. Com. Hons. '84)*

Solution :

Workings—

			Rs.
(1)	*Piece wages*		
	A—850 units @ Re. 0·20 per unit		170
	B—720 units @ Re. 0·20 per unit		144
	C—960 units @ Re. 0·20 per unit		192

(2) *Percentage of actual production on standard*

$$A— \quad \frac{850}{1,000} \times 100 \qquad\qquad 85\%$$

$$B— \quad \frac{720}{1,000} \times 100 \qquad\qquad 72\%$$

$$C— \quad \frac{960}{1,000} \times 100 \qquad\qquad 96\%$$

(3) *Excess production over 80% of standard*

A—	85% − 80%	5%
B—		Nil
C—	96% − 80%	16%

(4) *Additional production bonus @ Rs. 5 for each percentage of excess production*   Rs.

A—Rs. 5 × 5	25
B—	Nil
C—Rs. 5 × 16	80

Statement showing monthly remuneration

		A	B	C
		Rs.	Rs.	Rs.
Piece Wages	...	170	144	192
Additional Production Bonus	...	25	—	80
Dearness Wages (fixed)	...	50	50	50
House rent Allowance (fixed)	...	20	20	20
Tiffin Allowance (fixed)	...	20	20	20
Total monthly remuneration	...	**285**	**234**	**362**

Problem 7.

What will be the earning of a worker at Re. 0·55 per hour when he takes 140 hours to do a volume of work for which the standard time allowed is 200 hours. The plan of payment of bonus is on a sliding scale as under :

Within the first 10% of saving in standard time, bonus is	40% of time saved
Within the second 10% of saving in standard time, bonus is	50% of time saved
Within the third 10% of saving in standard time, bonus is	60% of time saved
Within the fourth 10% of saving in standard time, bonus is	70% of time saved
For the rest	75% of time saved

(I. C. W. A. Inter.)

Solution :

Time allowed	200 hours
Time taken	140 hours
Time saved	60 hours

Each slab of 10% of standard time represents $\frac{10}{100} \times 200 = 20$ hours

Additional hours for bonus payment :

40% of first 20 hours saved		8 hours
50% of next 20 hours saved		10 „
60% of next 20 hours saved		12 „
60		30 hours

Remuneration :	Rs.
Basic wage for 140 hours @ Re. 0·55	77·00
Bonus for 30 hours @ Re. 0·55	16·50
Total earnings	93·50

Note : Some authors made a different approach to the problem. They have calculated the slab not as a percentage of standard time but as a percentage of time saved (i.e. 10% of 60 hrs. or 6 hrs.) On the basis of this interpretation bonus hours will be calculated as below :

			Bonus hours
40% of first	6 hours saved		2·4
50% of next	6 „	„	3·0
60% of next	6 „	„	3·6
70% of next	6 „	„	4·2
75% of balance	36 „	„	27·0
	60		40·2

If this interpretation is accepted, it will be observed that every worker will get wages for $\left(\frac{40·2}{60} \times 100\right)$ or 67% of the time saved as bonus, irrespective of individual levels of efficiency. Breaking the time saved into slabs in such a case is futile and it does not serve any purpose. This interpretation cannot, therefore, be logically accepted.

Problem 8.

In a manufacturing concern bonus to workers is paid on a slab rate based on savings of cost towards labour and overheads. The following are the slab rates :

(i)			upto 10% saving	5% of the earning		
(ii)	above	10% and	,, 15%	,,	9% ,, ,,	,,
(iii)	,,	15% and	,, 20%	,,	13% ,, ,,	,,
(iv)	,,	20% and	,, 30%	,,	21% ,, ,,	,,
(v)	,,	30% and	,, 40%	,,	28% ,, ,,	,,
(vi)	above		40%	,,	32% ,, ,,	,,

The wage rates per hour of 4 workers—A, B, C and D are respectively Re. 1·00, Rs. 1·10, Rs. 1·20 and Rs. 1·40. Overhead is recovered on direct wages at the rate of 200%. Standard cost under wages and overhead per unit of production is fixed at Rs. 30. The workers have completed one unit each in 8, 7, $5\frac{1}{2}$ and 5 hours respectively. Calculate in respect of each worker :

    (a)   Amount of bonus earned.

    (b)   Total earnings.

    (c)   Total earnings per hour.

Solution :

	A	B	C	D
Time taken (hrs.)	8	7	5·5	5
Wage rate per hr. (Rs.)	1·00	1·10	1·20	1·40
Wages cost (time × rate) (Rs.)	8·00	7·70	6·60	7·00
Overheads (200% of wages) (Rs.)	16·00	15·40	13·20	14·00
Total of wages and overhead (Rs.)	24·00	23·10	19·80	21·00
Standard cost (Rs.)	30·00	30·00	30·00	30·00
Cost savings (Rs.)	6·00	6·90	10·20	9·00
% of savings on standard	20%	23%	34%	30%
% of bonus on earnings	13%	21%	28%	21%
(a) Amount of bonus (Rs.)	1·04	1·62	1·85	1·47
(b) Total earnings (Rs.)	9·04	9·32	8·45	8·47
(c) Total earnings per hr. (Rs.)	1·13	1·33	1·54	1·69

Problem 9.

From the following details calculate the total earnings of a worker and the effective hourly rate of labour wages where bonus is paid under (a) the Halsey (50%) scheme ; (b) the Rowan scheme :

Basic rate of wages per hour	Rs. 3·60
Time allowed for the job	16 hours
Time actually taken	12 hours

Solution :

   (*a*) *Under Halsey (50%) scheme*   **Rs.**
          Normal time wage : 12 hours @ Rs. 3·60   43·20
          Bonus : 50% of (time saved × time rate)
             i.e., 50% of (4 × 3·60)   7·20
                              Total wages   50·40

       Effective hourly rate $= \dfrac{\text{Rs. } 50·40}{12} =$ Rs. 4·20.

Alternatively

       Total wages = (time taken + 50% of time saved) × time rate
                   = (12 hours + 50% of 4 hours) × Rs. 3·60
                   = (12 hours + 2 hours) × Rs. 3·60
                   = 14 hours @ Rs. 3·60 = Rs. 50·40

   (*b*) *Under Rowan scheme*   **Rs.**
          Normal time wage : 12 hours @ Rs. 3·60   43·20
          Bonus : $\dfrac{\text{time saved}}{\text{time allowed}} \times$ (time taken × time rate)
             i.e., $\dfrac{4}{16} \times$ (12 × 3·60)   10·80
                                            Total wages   54·00

       Effective hourly rate × $= \dfrac{\text{Rs. } 54}{12} =$ Rs. 4·50.

Alternatively

       Bonus as a *percentage* of time rate
          $= \dfrac{\text{time saved}}{\text{time allowed}} \times 100$
          $= \dfrac{4}{16} \times 100 = 25\%$
       Bonus = 25% of Rs. 3·60 = Re. 0·90
                              or
       Bonus as a *fraction* of time rate
          $= \dfrac{\text{time saved}}{\text{time allowed}} \times$ time rate
          $= \dfrac{4}{16} \times$ Rs. 3·60 = Re. 0·90
       Effective hourly rate for time taken
          = Rs. 3·60 + Re. 0·90 = Rs. 4·50
       Total wages = 12 hours @ Rs. 4·50 = Rs. 54
                              or
       12 hours @ Rs. 3·60 *plus* 25% of (12 × Rs. 3·60)
          = Rs. 43·20 + Rs. 10·80 = Rs. 54.

Problem 10.

   A worker takes 80 hours to do a job for which the time allowed is
100 hours. His daily rate is Rs. 2·50 per hour. Calculate the works cost
of the job under the following methods of payment of wages :

   (i) Time rate, (ii) Piece rate, (iii) Halsey plan and (iv) Rowan plan.

Additional information :

  (i) Material cost Rs. 120.

  (ii) Factory overhead 125% of wages.   (*C. U., B. Com., Hons. '82*)

Solution :

Calculation of wages under different methods

(*i*) *Time Rate*

  Wages for 80 hrs. (actual time taken) @ Rs. 2·50   Rs. 200

(*ii*) *Piece Rate*

  Wages for 100 hrs. (time allowed for the job) @ Rs. 2·50   Rs. 250

(*iii*) *Halsey Plan*

  Normal time wage : 80 hrs. @ Rs. 2·50   Rs. 200

  Bonus : $\frac{1}{2}$ of (time saved × time rate)

        i.e., $\frac{1}{2}$ of (20 × 2·50)   25

                                      Rs. 225

(*iv*) *Rowan Plan*

  Normal time wage : 80 hrs. @ Rs. 2·50   Rs. 200

  Bonus : $\frac{\text{time saved}}{\text{time allowed}}$ × (time taken × time rate)

        i.e., $\frac{20}{100}$ × (80 × 2·50)   40

                                      Rs. 240

Statement of Comparative Works Cost

		Time Rate Rs.	Piece Rate Rs.	Halsey Plan Rs.	Rowan Plan Rs.
Materials	..	120·00	120·00	120·00	120·00
Direct Wages	...	200·00	250·50	225·00	240·00
Prime Cost	..	320·00	370·00	345·00	360·00
Factory Overhead (125% of Direct Wages)	...	250·00	312·50	281·25	300·00
Works Cost	...	570·00	682·50	626·25	660·00

Problem 11.

  A worker whose basic rate of pay is 60 paise per hour is working under a 50 : 50 Halsey Premium Bonus Scheme. Besides, he gets a dearness allowance of Rs. 2·00 per day of 8 hours. Calculate his total earnings and the effective rate of earning per hour for executing a piece of work in 40 hours as against 52 hours allowed.

Solution :

                                                          Rs.
  Normal time wage : 40 hours @ Re. 0·60   24·00

  Bonus : $\frac{1}{2}$ of (time saved × time rate)

        i.e., $\frac{1}{2}$ of (12 × 0·60)   3·60

  Dearness Allowance : $\frac{\text{Rs. 2·00}}{8}$ × 40   10·00

        Total earnings   37·60

  Effective rate per hour = $\frac{\text{Rs. 37·60}}{40}$ or Re. 0·94.

Problem 12.

The standard output of a certain product is fixed (by applying the principles of time and motion study) at 2,000 units per day of 8 hours. Calculate the earnings of a worker who produces 2,750 units per day under the Halsey Premium Bonus Scheme (40 per cent to worker). The standard rate per day is Rs. 6·40.

Solution :

Standard time for 2,750 units (actual production)

$$\frac{2,750}{2,000} \times 8 \text{ hrs.}$$ 11 hrs.

Actual time taken for 2,750 units	8 hrs.
Time saved	3 hrs.

Time wage per hour : $\dfrac{\text{Rs. } 6\cdot40}{8}$ = Re. 0·80

	Rs.
Normal day wages	6·40
Bonus : $\frac{40}{100}$ of (time saved × time rate)	
i.e., $\frac{40}{100}$ of (3 × 0·80)	0·96
Total earnings	7·36

Problem 13.   •

An operator engaged in machining certain components received an ordinary day rate of Rs. 1·60 per day of 8 hours. The standard output for machining the components has been fixed at 80 pieces per hour (time as fixed for premium bonus). On a certain day, the output of the worker on the machine is 800 pieces. Find the labour cost per 100 pieces and the wages that would have been actually earned by the workman under the following :

(a)   If a bonus of Re. 0·23 is paid per 100 of the extra output.

(b)   If paid for on straight piece work basis at the standard rate.

(c)   If Halsey Premium Bonus System is being adopted.

(I. C. W. A. Inter.)

Solution :

Wage per day of 8 hours	Rs. 1·60
Standard output : 80 × 8	640 pieces
Actual output	800 pieces

1st Method—

Extra output : 800 − 640	160 pieces
	Rs.
Normal day wage	1·60
Bonus for extra output : 160 pieces	
@ Re. 0·23 per 100 $\left(\dfrac{0\cdot23}{100} \times 160\right)$	0·37
Total wages for 800 pieces	1·97

Labour cost per 100 pieces $= \frac{100}{800} \times$ Rs. 1·97 or, Re. 0·246

2nd Method—

Standard piece rate per 100 units : $\frac{100}{120} \times$ Rs. 1·60 = Re. 0·25

Wages for 800 units @ Re. 0·25 per 100 = Rs. 2·00

3rd Method—

Standard time allowed for 800 units (actual production) : $\frac{800}{80} \times 1$ hour	10 hours
Actual time taken for 800 units	8 hours
Time saved	2 hours
Time wage per hour : $\frac{\text{Rs. 1·60}}{8}$	Re. 0·20

	Rs.
Normal day wage	1·60
Bonus : $\frac{1}{2}$ of (time saved × time rate) i.e., $\frac{1}{2}(2 \times 0·20)$	0·20
Total wages for 800 pieces	1·80

Labour cost per 100 pieces = $\frac{100}{800} \times$ Rs. 1·80 or Re. 0·225.

Problem 14.

An employee working under a bonus scheme saves 4 hours in a job for which the standard time is 32 hours. Calculate the rate per hour worked and wages payable for the time taken under the following alternative schemes. (Award rate Re. 1·00 per hour.)

(i) Employee receives an increase in the hourly rate based on the percentage that the time saved bears to the time set.

(ii) A bonus of 10 per cent on award rate is payable when standard time (namely, 100 per cent efficiency) is achieved plus a further bonus of 1 per cent on award rate for each 1 per cent in excess of that 100 per cent efficiency. *(I. C. W. A. Inter.)*

Solution :

1st Case

Standard time	32 hours
Actual time (32 − 4)	28 hours
Time saved	4 hours
Award rate per hour	Re. 1·00

Time saved expressed as a percentage of standard time

$$= \frac{\text{time saved}}{\text{time allowed}} \times 100 \text{ per cent} = \frac{4}{32} \times 100 \text{ per cent} = 12\frac{1}{2}\%$$

Effective rate per hour worked

= Re. 1·00 plus $12\frac{1}{2}\%$ = Rs. 1·125

Total wages payable = 28 hours @ Rs. 1·125

= Rs. 31·50

2nd Case

Standard time 32 hours = 100% efficiency

Actual time 28 hours = $\frac{32}{28} \times 100$ = 114% efficiency

	Rs.
Normal time wage : 28 hours @ Re. 1·00	28·00
Bonus for achieving 100% efficiency : 10% of	
Rs. 28·00	2·80
Additional bonus (@ 1% for each 1% in excess	
of 100% efficiency) : 14% of Rs. 28·00	3·92
Total wages payable	34·72

Effective rate per hour worked $= \dfrac{\text{Rs. } 34\cdot 72}{28}$ or Rs. 1·24

Alternatively

	Rs.
Normal rate per hour	1·00
10% bonus for achieving 100% efficiency	0·10
14% additional bonus (@ 1% for each 1% in	
excess of 100% efficiency)	0·14
Effective rate per hour worked	Rs. 1·24

Total wages payable $= 28$ hours @ Rs. 1·24

$\qquad\qquad\qquad = $ Rs. 34·72

Problem 15.

(a) *A*, *B* and *C* are the members of a team making metal brackets. The expected output of the team is 6,000 brackets per week, each member working a 40-hour week and being paid a basic rate of Rs. 1·75 for each hour worked. A bonus of 50 per cent of the team's productivity index in excess of 100 is added as a percentage to the basic hourly rate. During week No. 50, *A* worked 40 hours, *B* 39 hours and *C* 38 hours and the output for the week was 6,786 brackets.

You are required to calculate for week No. 50 :
  (i)   the team's productivity index ;
  (ii) the effective hourly rate paid to the operatives ;
  (iii) the wages rate and efficiency variances of the team.

(b) Name the type of bonus scheme under which the members of the team are remunerated and demonstrate your understanding of the characteristics of that scheme by referring to your answer to (a).

Solution :

(a) Standard production for (3×40) or 120 labour hours
        working   6,000 brackets
    Expected production for $(40 + 39 + 38)$ or 117 actual
        labour hours worked $= \dfrac{117}{120} \times 6{,}000 = 5{,}850$ **brackets**

  Production achieved 6,786 brackets

  Productivity index $= \dfrac{6{,}786}{5{,}850} \times 100 = 116$

Effective hourly rate of pay
        = Rs. 1·75 plus 8% (i.e., 50% of productivity index in excess
        = Rs. 1·75 + Re. 0·14 = Rs. 1·89
Standard cost of 6,000 brackets
        = 120 hours @ Rs. 1·75 = Rs. 210
Standard cost of 6,786 brackets (actual production)

$$= \frac{6,786}{6,000} \times Rs.\ 210 = Rs.\ 237·51$$

Actual cost = 117 hours   Rs. 1·89 = Rs. 221·13

		Rs.
Wages variance		
standard cost ~ actual cost 237·51 ~ 221·13		16·38F
Wages Rate Variance		
(standard rate ~ actual rate) × actual hours		
(1·75 ~ 1·89) × 117		16·38A
Wages Efficiency Variance		
(standard quantity ~ actual quantity) × standard		
rate per unit (5,850 ~ 6,786) × Re. 0·35		32·76F
Check : Wages Variance = Rate + Efficiency		16·38F

Notes : For part (a) (iii) of the problem students are advised to see the chapter on Standard Costing and Variance Analysis in Vol. II of the same treatise.

(b) The bonus scheme under which the members of the team are remunerated is of the Halsey type and provides for a minimum wage of Rs. 1·75 for each hour worked plus a bonus of 50% of the time saved at the normal hourly rate. The efficiency of workers has resulted in a saving of Rs. 32·76 which has been shared equally between workers and employer.

Problem 16.

During the first week of July, 1985, the workman Shri Netaicharan manufactured 300 articles. He received wages for a guaranteed 48 hour-week at the rate of Rs. 4 per hour. The estimated time to produce one article is 10 minutes and under incentive scheme the time allowed is increased by 20%. Calculate his gross wages and effective hourly rate according to :

    (a) Piece work with a guaranteed weekly wage ;

    (b) Rowan premium bonus ; and

    (c) Halsey premium bonus, 50% to workman.

Solution :

Estimated time for 1 unit	10 minutes
Add : 20% increase under incentive scheme	2 minutes
Time Allowed	12 minutes

Rate per unit $= \frac{12}{60} \times$ Rs. 4 = Re. 0·80 (i.e., wage for 12 minutes)

Time allowed for producing 300 units : $300 \times \frac{12}{60}$	60 hours
Time taken	48 hours
Time saved	12 hours

(a) **Wages under piece work with a guaranteed weekly wage :**

Wages for 300 units @ Re. 0·80 per unit (being
more than the guaranteed wage of Rs. 192
for 48 hours)   Rs. 240

Alternatively :

Wages for 60 hours (time allowed for producing
300 units) i.e., 60 × Rs. 4   Rs. 240

Effective rate per hour $\dfrac{Rs.\ 240}{48}$ = Rs. 5

(b) **Wages under Rowan Premium Bonus Plan** :

$$$$
Rs

Normal time wage : 48 hours @ Rs. 4 per hour   192·00

Bonus : $\dfrac{time\ saved}{time\ allowed} \times (time\ taken \times time\ rate)$

i.e., $\frac{12}{60} \times 48 \times$ Rs. 4   38·40
Total wages   230·40

Effective rate per hour $= \dfrac{Rs.\ 230\cdot40}{48} =$ Rs. 4·80

(c) **Wages under Halsey Premium Bonus Plan** :
Rs.

Normal time wage : 48 hours @ Rs. 4 per hour   192·00
Bonus : $\frac{1}{2} \times$ (time saved × time rate)
i.e., $\frac{1}{2} \times$ (12 × Rs. 4)   24·00
Total wages   216·00

Effective rate per hour $\dfrac{Rs.\ 216\cdot00}{48} =$ Rs. 4·50.

Problem 17.

The production section of a factory working on the job-order system pays their workers under the Rowan Premium Bonus Scheme. Workers also get a dearness allowance of Rs. 12 per week of 48 hours.

A worker's basic wage is Rs. 2 per day of 8 hours and his time sheet for a week is summarised below :

Job No.	Time Allowed	Time taken
1001	25 hrs.	20 hrs.
1013	30 hrs.	20 hrs.
Idle time (waiting)		8 hrs.
		48 hrs.

Calculate the gross wages he has earned for the week and indicate the accounts to which the wage amounts will be debited.

(C. U., B. Com.—Hons.)

Solution :

Time Rate $= \dfrac{\text{Rs. } 2}{8}$ or Re. 0·25 per hour

Bonus $= \dfrac{\text{time saved}}{\text{time allowed}} \times (\text{time taken} \times \text{time rate})$

Bonus earned for Job No. 1001 $= \frac{8}{2 \cdot 5} \times (20 \times 0 \cdot 25) = $ Re. 1·00

Bonus earned for Job No. 1013 $= \frac{10}{30} \times (20 \times 0 \cdot 25) = $ Rs. 1·67

Gross wages for the week to be debited to :

Job No. 1001 A/c	Rs.	Rs.
Normal time wage : 20 hrs. @ Re. 0·25	5·00	
Bonus	1·00	
Dearness Allowance : $\frac{20}{48} \times$ Rs. 12	5·00	
		11·00
Job No. 1013 A/c		
Normal time wage : 20 hrs. @ Re. 0·25	5·00	
Bonus	1·67	
Dearness Allowance · $\frac{20}{48} \times$ Rs. 12	5·00	
		11·67
Works overhead (idle time) A/c		
Idle time : 8 hrs. @ Re. 0·25	2·00	
Dearness Allowance : $\frac{8}{48} \times$ Rs. 12	2·00	4·00
Gross wages earned		26·67

Problem 18.

One foreman, one operator, one labourer and one boy undertake to manufacture 150 articles on piece work basis for Rs. 660. Each of the above spends 100 ordinary hours on the work and their wage rates are as follows :

Foreman and operator Rs. 2 per hour each, labourer Re. 1 per hour and the boy 50 paise per hour.

Find out the amount of the piece work premium and show the amount which each worker will receive by way of premium when it is divided in proportion to the wages paid and show in each case the percentage the premium bears to the wage payments at the ordinary rates.

Solution :

Time wages of the group	Rs.
1 Foreman @ Rs. 2 per hour for 100 hours	200
1 Operator @ Rs. 2 per hour for 100 hours	200
1 Labourer @ Re. 1 per hour for 100 hours	100
1 Boy @ Re. 0·50 per hour for 100 hours	50
Total time wages	550
Piece work wages	660
Piece work premium	110

This premium will be divided in the ratio of time wages of the members of the group, i.e., 200 : 200 : 100 : 50 or 4 : 4 : 2 : 1.

The Foreman will receive $\frac{4}{11} \times$ Rs. 110 = Rs. 40 or 20% of his wages

The Operator will receive $\frac{4}{11} \times$ Rs. 110 = Rs. 40 or 20% of his wages

The Labourer will receive $\frac{2}{11} \times$ Rs. 110 = Rs. 20 or 20% of his wages

The Boy will receive $\frac{1}{11} \times$ Rs. 110 = Rs. 10 or 20% of his wages.

Problem 19.

In an assembly shop of a motor cycle factory 4 workmen A, B, C and D work together as a team and are paid on group piece rate. They also work individually on day rate jobs. In a 44-hour week the following hours have been spent by A, B, C and D on group piece-work, viz., A—40 hours, B—40 hours, C—30 hours and D—20 hours. The balance of the time has been booked by each worker on day work jobs. Their hourly rates are :

A—Re. 0·50 B—Re. 0·75

C—Re. 1·00 D—Re. 1·00

The group piece rate is Re. 1·00 per unit and the team has produced 150 units. Calculate the gross weekly earning of each workman taking into consideration that each individual is entitled to dearness allowance of Rs. 20·00 per week.   (*C. U., B. Com. Hons.*)

Solution :

Total piece earnings of the group = Re. 1·00 × 150 = Rs. 150

Time wages of the workers for the time of group works = time rate × hours spent.

A : Re. 0·50 × 40 = Rs. 20

B : Re. 0·75 × 40 = Rs. 30

C : Re. 1·00 × 30 = Rs. 30

D : Re. 1·00 × 20 = Rs. 20

Hence, the total piece earnings of the group (Rs. 150) will be shared by them in the ratio of 20 : 30 : 30 : 20.

Statement showing weekly earnings

	A Rs.	B Rs.	C Rs.	D Rs.
Individual time wages—				
A : (44−40) or 4 hours @ Re. 0·50 ...	2	—	—	—
B : (44−40) or 4 hours @ Re. 0·75 ...	—	3	—	—
C : (44−30) or 14 hours @ Re. 1·00 ...	—	—	14	—
D : (44−20) or 24 hours @ Re. 1·00 ...	—	—	—	24
Group piece wages—Rs. 150 in the ratio of 20 : 30 : 30 : 20 ...	30	45	45	30
Dearness allowance ...	20	20	20	20
Total weekly earnings ...	**52**	**68**	**79**	**74**

Problem 20.

In a unit, 10 men work as a group. When the production of the group exceeds the standard output of 200 pieces per hour, each man is paid an incentive for the excess production in addition to his wages at hourly rate. The incentive is at half the percentage, the excess production over standard bears to the standard production. Each man is paid an incentive at the rate of this percentage of a wage rate of Rs. 2 per hour. There is no relation between the individual workman's hourly rate and the bonus rate.

In a week, the hours worked are 500 hours and the total production is 1,20,000 pieces.

(a) Compute the total amount of bonus for the week.

(b) Calculate the total earnings of two workers *A* and *B* of the group—

A worked 44 hours and his basic rate per hour was Rs. 2·20.

B worked 48 hours and his basic rate per hour was Rs. 1·90.

(I. C. W. A.—Inter.)

Solution :

(a) **Total amount of bonus of the week :**

Actual production	1,20,000 pieces
Standard production in 500 hours @ 200 pieces per hour	1,00,000 pieces
Excess production over standard	20,000 pieces

Incentive percentage $= \frac{1}{2}$ of $\left(\frac{20,000}{1,00,000} \times 100 \right) = \frac{1}{2}$ of $20\% = 10\%$

Hourly rate of incentive payment $= 10\%$ of Rs. $2 =$ Re. 0·20
Total amount of bonus for the week for 500 hours @ Re. 0·20
$=$ Rs. 100·00.

(b) **Total earnings**

Worker A—

Basic earnings for 44 hours @ Rs. 2·20	Rs. 96·80
Incentive for 44 hours @ Re. 0·20	Rs. 8·80
Total	Rs. 105·60

Worker B—

Basic earnings for 48 hours @ Rs. 1·90	Rs. 91·20
Incentive for 48 hours @ Re. 0·20	Rs. 9·60
Total	Rs. 100·80

Problem 21.

A company manufactures three products *D*, *E* and *F*. It has thirty employees who are paid under a group bonus scheme. There are three grades of employees who are paid a bonus of the excess of time allowed over time taken. The bonus is paid on the employee's base rate less Re. 0·75 and is shared among the direct workers in proportion to the time

spent on the work. The production details for the period in question were as follows :

	Product		
	D	*E*	*F*
Units produced	80	160	300
Time allowed per unit (minutes)	63	120	100
	Grade of Employee		
	R	*S*	*T*
Number of direct employees	10	4	16
Base rate (Rs.)	2·00	1·80	1·85
Hours worked by each employee	15·	32	25

From the above information you are required to calculate (a) the percentage of hours saved to hours taken, (b) the total bonus payable to the group of direct employees, and (c) the total wages payable to the group of direct employees.

Solution :

Time allowed

Product	Units produced	Time allowed per unit *(minutes)*	Total time allowed *(hours)*
D	80	63	84
E	160	120	320
F	300	100	500
			904

Hours worked

Grade of employee	No. of employees	Hours worked per employee	Total hours worked
R	10	15	150
S	4	32	128
T	16	25	400
			678

(*a*) *Percentage of hours saved to hours taken :*

Hours allowed	904
Hours worked	678
Hours saved	226

$$\text{Percentage} = \frac{\text{hours saved}}{\text{hours worked}} \times 100 = \frac{226}{678} \times 100 = 33\tfrac{1}{3}\%$$

(*b*) *Bonus payable*

Grade of employee	Hours worked	Bonus 33⅓% *(hours)*	Rate (= Base rate − Re. 0·75)	Bonus
			Rs.	Rs.
R	150	50	1·25	62·50
S	128	42⅔	1·05	44·80
T	400	133⅓	1·10	146·67
	678	226		253·97

(c)   **Total wages payable**

Grade of employee	Hours worked	Base rate Rs.	Wages Rs.	Bonus Rs	Total Rs.
R	150	2·00	300·00	62·50	362·50
S	128	1·80	230·40	44·80	275·20
T	400	1·85	740·00	146·67	886·67
	678		1,270·40	253·97	1,524·37

Problem 22.

Both direct and indirect labour of a department in a factory are entitled to production bonus in accordance with a Group Incentive Scheme, the outlines of which are as follows :

(a) For any production in excess of the standard rate fixed at 10,000 tonnes per month (of 25 days) a general incentive of Rs. 10 per tonne is paid in aggregate. The total amount payable to each separate group is determined on the basis of an assumed percentage of such excess production being contributed by it, namely, @ 70% by Direct Labour, @ 10% by inspection staff, @ 12% by maintenance staff and @ 8% by supervisory staff.

(b) Moreover, if the excess production is more than 20% above the standard, direct labour also gets a special bonus @ Rs. 5 per tonne for all production in excess of 120% of standard.

(c) Inspection staff are penalised @ Rs. 20 per tonne for any rejection by customer in excess of 1% of actual production.

(d) Maintenance staff are also penalised @ Rs. 20 per hour of machine breakdown.

From the following particulars for a month work out the production bonus earned by each group :

   (i)   Actual working days—20

  (ii)   Production—11,000 tonnes

 (iii)   Rejection by customer—200 tonnes

 (iv)   Machine breakdown—40 hours.   *(I. C. W. A.—Inter.)*

Solution :

   Excess production—

Actual production	11,000 tonnes
Standard production $\frac{20}{25} \times 10,000$	8,000 tonnes
Excess production over standard	3,000 tonnes
20% of standard production	1,600 tonnes
Excess production above 120% of standard	1,400 tonnes

General incentive :   3,000 tonnes @ Rs. 10 per ton = Rs. 30,000

Special incentive :   1,400 tonnes @ Rs. 5 per ton = Rs.   7,000

Penalty—

   Inspection staff (200 – 1% of 11,000) or 90 tonnes @ Rs. 20 = Rs. 1,800

   Maintenance staff 40 hrs. @ Rs. 20 = Rs. 800.

Statement of Bonus Earned

		Rs.	Rs.
Direct labour—			
Share of general incentive 70 of Rs. 30,000	...	21.000	
Special incentive	..	7.000	
			28,000
Inspection staff			
Share of general incentive 10 of Rs. 30,000	..	3,000	
Less : Penalty	...	1 800	
			1,200
Maintenance staff—			
Share of general incentive 12% of Rs. 30,000	..	3,600	
Less : Penalty	...	800	
			2,800
Supervisory staff—			
Share of general incentive 8% of Rs. 30,000	..		2,400
			34,400

Problem 23.

The standard production in a company is 20 units per hour. For the first week of April, a worker's record was as follows :

Monday	140 units	8 hours
Tuesday	160 ,,	8 ,,
Wednesday	175 ,,	8 ,,
Thursday	180 .,	8 ,,
Friday	200 ,,	8 ,,

You are required to draw up a schedule showing the worker's daily earnings, the effective hourly rate of earning and the labour cost per unit, if the company uses :

(a) Halsey Premium Plan with a guaranteed rate of Rs. 4·50 per hour and a premium of 60% of the time saved on production in excess of standard : or

(b) The Taylor Differential Piece Rate system with rates of 20 paise per unit below standard, 24 paise per unit at standard and upto 20% above standard and 30 paise per unit for all production when daily output exceeds 10% of the standard.

Solution :

(a)   **Halsey Premium Plan**

1	2	3	4	5	6	7	8	9
Days	Production units	Time allowed (col. 2÷20) Hrs.	Time saved (8—col.3) Hrs.	Basic time wage (8×Rs. 4·50) Rs.	Bonus (col. 4× $\frac{60}{100}$ ×4·50) Rs.	Total earnings (col. 5+ col. 6) Rs.	Effective hourly rate (col. 7÷8) Rs.	Labour cost/unit (col. 7÷ col. 2) Rs.
Monday	140	7	—	36·00	—	36·00	4·50	0·26
Tuesday	160	8	—	36·00	—	36·00	4·50	0·23
Wednesday	175	8·75	0·75	36·00	2·03	38·03	4·75	0·22
Thursday	180	9	1	36·00	2·70	38·70	4·84	0·22
Friday	200	10	2	36·00	5·40	41·40	5·18	0·21

(b) Taylor Differential Piece Rate System

Standard production per day : 8 × 20 = 160 units

20% of standard production : 20% of 160 = 32 units

Piece rates applicable—

For production less than 160 units	20 paise per unit
For production between 160 and 192 units	24 ,, ,, ,,
For production above 192 units	30 ,, ,, ,,

Days	Production (units)	Piece Rate Rs.	Total earnings Rs.	Effective hourly rate Rs.	Labour cost/unit Rs.
Monday	140	0·20	28·00	3·50	0·20
Tuesday	160	0·24	38·40	4·80	0·24
Wednesdy	175	0·24	42·00	5·25	0·24
Thursday	180	0·24	43·20	5·40	0·24
Friday	200	0·30	60·00	7·50	0·30

Problem 24.

The time allowed for a job is 12 hours. The hourly labour rate is Rs. 2. Prepare a statement, showing the bonus earned, total earnings and hourly earnings under Halsey System and Rowan System of premium bonus for every two hours saved progressively. Give your comments on the comparative findings in the two systems.

Solution :

Comparative statement of wages

Time allowed Hrs.	Time taken Hrs.	Time saved Hrs.	Normal time wage Rs.	Bonus Halsey Rs.	Bonus Rowan Rs.	Total Earnings Halsey Rs.	Total Earnings Rowan Rs.	Earnings/hr. Halsey Rs.	Earnings/hr. Rowan Rs.
12	12	—	24·00	—	—	24·00	24·00	2·00	2·00
12	10	2	20·00	2·00	3·33	22·00	23·33	2·00	2·33
12	8	4	16·00	4·00	5·33	20·00	21·33	2·50	2·67
12	6	6	12·00	6·00	6·00	18·00	18·00	3·00	3·00
12	4	8	8·00	8·00	5·33	16·00	13·33	4·00	3·33
12	2	10	4·00	10·00	3·33	14·00	7·33	7·00	3·67

The following observations could be drawn from the comparative statement prepared above :

(1) Under Halsey System bonus increases steadily with the increase in efficiency. Under Rowan System, on the other hand, bonus increases upto a certain level of efficiency (i.e., where 50% of the allotted time is saved) and then it begins to decline.

(2) When the time saved is *less* than 50% of the standard time, a worker earns more wage under Rowan System than under Halsey System. A worker who saves more than 50% of the standard time will earn *more* wages under Halsey System than under Rowan System. It may be noted

that, in Rowan System a less efficient worker may get the same bonus as a more efficient one gets. For example, a worker who completes the job in 10 hours gets the same bonus, i.e., Rs. 3·33 which is paid to a worker who completes the job in only 2 hours. The Rowan System, therefore, provides a safeguard against a loose fixation of standards.

(3) Under Halsey System, a worker can double his earnings per hour if he can save two-thirds of the standard time (compare item 1 and item 5 of column 9). Under Rowan Scheme earnings per hour can never be doubled.

(4) The quality of work under Halsey Scheme may deteriorate resulting from overspeed in work with a view to earning more bonus. Under Rowan Scheme overspeeding is arrested, because there is an automatic check on the earnings.

(5) When the time saved is half of the standard time, bonus under both the systems is the same. This is, again, the level of efficiency where bonus under Rowan System is the maximum.

From the above observation it may be concluded that the Rowan System is better than the Halsey System.

Problem 25.

For a certain work order the standard time is 20 hours, wage Rs. 5 per hour, the actual time taken is 13 hours and factory overhead charges are 80% of direct wages for standard time.

Set out a comparative statement 'showing the effect of paying wages on (i) the Halsey and (ii) the Rowan Incentive Bonus Systems.

(C. U., M. Com.)

Solution :

Standard time	20 hours	
Actual time taken	13 ,,	
Time saved	7 ,,	

Normal time wages : 13 hrs. @ Rs. 5 — Rs. 65

Bonus under the Halsey System—
$\frac{1}{2}\times$(time saved $\times$ time rate) i.e., $\frac{1}{2}\times(7\times$Rs. 5) — Rs. 17·50

Bonus under the Rowan System—
$\dfrac{\text{time saved}}{\text{standard time}}\times$(time taken $\times$ time rate)

i.e., $\frac{7}{20}\times(13\times$Rs. 5) — Rs. 22·75

Employer's savings under the Halsey Plan—

	Rs.	Rs.
Saving of labour cost—		
Standard wages : 20 hrs. @ Rs. 5	100·00	
Actual wages : Rs. (65·00+17·50)	82·50	
		17·50
Saving of overhead—80% of Rs. (100−65)		28·00
Total Rs.		45·50

Employer's savings under the Rowan Plan—

	Rs.	Rs.
Saving of labour cost—		
Standard wages : 20 hrs. @ Rs. 5	100·00	
Actual wages : Rs. (65·00+22·75)	87·75	
		12·25
Saving of overhead—80% of Rs. (100−65)		28·00
	Total Rs.	40·25

Comparative statement showing the effect of paying wages under Halsey and Rowan Plans

Incentive System	Normal Wages Rs.	Bonus Rs.	Total earnings Rs.	Effective rate/hour[1] Rs.	Employer's savings Rs.
Halsey	65·00	17·50	82·50	6·35	45·50
Rowan	65·00	22·75	87·75	6·75	40·25

Note : [1]Effective rate/hour== $\dfrac{\text{Total earnings}}{\text{Actual time taken}}$.

Problem 26.

In a factory bonus system, bonus hours are credited to the employee in the proportion of time taken which time saved bears to time allowed. Jobs are carried forward from one week to another. No overtime is worked and payment is made in full for all units worked on, including those subsequently rejected.

From the following information you are required to calculate for each employee :

(a) the bonus hours and the amount of bonus earned :

(b) the total wage costs :

(c) the wage cost of each good unit produced.

Employee	*A*	*B*	*C*
Basic wage rate, per hour	Re. 0·50	Re. 0·80	Re. 0·75
Units issued for production	2,500	2,200	3,600
Time allowed for 100 units	2 hrs. 36 mts.	3 hrs.	1 hr. 30 mts.
Time taken	52 hrs.	75 hrs.	48 hrs.
Rejects	100 units	40 units	400 units.

(I. C. W. A. Eng.—Adapted)

Solution :

Employee		*A*		*B*		*C*
Time allowed	(2hrs. 36mts.×25)	65 hrs.	(3hrs.×22)	66 hrs.	(1hr. 30mts.×36)	54 hrs.
Time taken		52 hrs.		75 hrs.		48 hrs.
Time saved		13 hrs.		---		6 hrs.
(a) Bonus earned ($\frac{13}{65}$ × 52 × 0·50)		Rs. 5·20		—	($\frac{6}{54}$×48×0·75)	Rs. 4·00
Basic wages (52×0·50)		Rs. 26·00	(75 × 0·80)	Rs. 60·00	(48×0·75)	Rs. 36·00
(b) Total wages costs		Rs. 31·20		Rs. 60·00		Rs. 40·00
Good units produced	(2,500−100)	2,400	(2,200−40)	2,160	(3,600−400)	3,200
(c) Wages cost per unit of good output		Re. 0·013		Re. 0·0278		Re. 0·0125

Problem 27.

Jobs are issued to operator X, to make 189 units, and to operator Y, to make 204 units, for which a time allowance of 20 standard minutes and 15 standard minutes per unit respectively, is credited. For every hour saved, bonus is paid at 50% of the base rate, which is Rs. 4 per hour for both the employees. The basic working week is 42 hours. Hours in excess are paid at time rate plus one-third.

X completes his units in 45 hours and Y completes his units in 39 hours (but works a full week). Due to defective material, six of X's units and four of Y's units are subsequently scrapped, although all units produced are paid for.

You are required to calculate for each of X and Y:

    (a) the amount of bonus payable ;

    (b) the total gross wage payable ;

    (c) the wages cost per good unit made.

<div align="right">(I. C. W. A. Eng.—Adapted)</div>

Solution :

		X	Y
Time allowed	$(189 \times \frac{20}{60})$	63 hrs.	$(204 \times \frac{15}{60})$ 51 hrs.
Time taken		45 hrs.	39 hrs.
Time saved		18 hrs.	12 hrs.
(a) Bonus payable		$18 \times \frac{1}{2} \times$ Rs. 4 = Rs. 36	$12 \times \frac{1}{2} \times$ Rs. 4 = Rs. 24
Basic pay for the week		$42 \times$ Rs. 4 Rs. 168	$42 \times$ Rs. 4 Rs. 168
Overtime		$3 \times 1\frac{1}{3} \times$ Rs. 4 Rs. 16	Nil
Bonus		Rs. 36	Rs. 24
(b) Gross wage payable		Rs. 220	Rs. 192
Good units produced		$(189-6) = 183$	$(204-4) = 200$
Wage cost per good unit		$\dfrac{\text{Rs. } 220}{183}$	$\dfrac{\text{Rs. } (192-12)^{[1]}}{200}$
		= Rs. 1·202 (approx.)	= Re. 0·90

Note : [1]It has been assumed that 3 hours @ Rs. 4 were booked to day rate work. Hence Y's basic pay has been taken as 42 × Rs. 4 instead of 39 × Rs. 4.

Problem 28.

The existing incentive system of a certain factory is :

Normal working week	5 days of 9 hours *plus* 3 late shifts of 3 hours each.
Rate of payment	Day work Re. 1·00 per hour late shift Rs. 1·50 per hour.
Additional bonus payable	Rs. 2·50 per day shift Rs. 1·50 per late shift.
Average output per operative for 54-hour week, i.e., including 3 late shifts.	120 articles

In order to increase output and eliminate overtime it was decided to switch on to a system of payment by results. The following information is obtained :

Time rate (as usual)	Re. 1 per hour
Basic time allowed for 15 articles	5 hours
Piece-work rate	add 20% to piece
Premium	add 50% to time

You are required to show :

(i) hours worked ; (ii) weekly earnings ; (iii) number of articles produced and (iv) labour cost per article for one operative under the following system :

(a) Existing time rate ; (b) Straight piece work ; (c) Rowan system ; (d) Halsey system.

Assume that 135 articles are produced in a 45-hour week under (b), (c) and (d) and that the worker earns half the time saved under the Halsey system. The additional bonus under the existing system will be discontinued in the proposed incentive scheme. (*I. C. W. A. Inter.—Adapted*)

Solution :

(a) *Existing time rate*

	Rs
Normal wages : 5×9 or 45 hrs. @ Re. 1 per hour	45·00
Overtime wages : 3×3 or 9 hrs. @ Rs. 1·50 per hour	13·50
Day shift bonus : 5 days @ Rs. 2·50 per day	12·50
Late shift bonus : 3 shifts @ Rs. 1·50 per shift	4·50
Total weekly earnings	75·50

(b) *Straight piece rate*

Time allowed for producing 15 articles—5 hrs.

Time allowed for producing 135 articles $\frac{5}{15} \times 135 = 45$ hrs.

	Rs.
Normal wages for 45 hrs. @ Re. 1 per hour	45·00
Add 20%	9·00
Total weekly earnings	54·00

(c) *Rowan system*

Time allowed for 135 articles (as calculated above)	45 hrs.
Add 50%	22½ ,,
Time allowed under premium plan	67½ ,,
Actual time taken	45 ,,
Time saved	22½ ,,

	Rs.
Normal time wage : 45 hrs. @ Re. 1 per hour	45·00

Bonus : $\dfrac{\text{Time saved}}{\text{Time allowed}} \times (\text{time taken} \times \text{time rate})$ i.e.,

$\dfrac{22\frac{1}{2}}{67\frac{1}{2}} \times \text{Rs. } 45$	15·00
Total weekly earnings	60·00

Cost (Part I)—15

(d) Halsey system

Rs.

Normal time wage : 45 hrs. @ Re. 1 per hour.   45·00

Bonus $\frac{1}{2}\times$(time saved $\times$ time rate) i.e.,

$\frac{1}{2}\times(22\frac{1}{2}\times$ Re. 1)   11·25

Total weekly earnings   56·25

Statement showing information under different methods of wage payment

Method	Hours worked	Weekly earnings Rs.	Number of articles produced	Labour cost/article Rs.
(a) Existing time rate	54	75·00	120	0·629
(b) Straight piece rate	45	54·00	135	0·400
(c) Rowan system	45	60·00	135	0·444
(d) Halsey system	45	56·25	135	0·417

Problem 29.

The standard time for a job is 60 hours. The hourly rate of guaranteed wages is Re. 0·75. Because of the saving in time, worker A gets an hourly wage of Re. 0·90 under Rowan premium bonus system. For the same saving in time, calculate the hourly rate of wages that worker B will get under Halsey-Weir premium bonus system (assuming 40 per cent to worker).

(I. C. W. A.—Inter.)

Solution :

Let actual time taken by A for completing the job is x hours. Then, under the Rowan system, his total wages

$$= \text{time taken} \times \text{time rate} + \frac{\text{time saved}}{\text{standard time}} \text{ (time taken} \times \text{time rate)}$$

$$= x \times 0·75 + \frac{(60-x)}{60} (x \times 0·75)$$

$$= 0·75x + \frac{(60-x)\,0·75x}{60}$$

$$\therefore \text{ Hourly rate of wages} = \frac{0·75x + \frac{(60-x)\,0·75x}{60}}{x}$$

$$= 0·75 + \frac{(60-x)\,0·75}{60}$$

Now as given—

$$0·75 + \frac{(60-x)\,0·75}{60} = 0·90$$

or, $\dfrac{(60-x)\,0·75}{60} = 0·15$

or, $(60-x)\,0·75 = 60 \times 0·15$

or, $(60-x) = \dfrac{60 \times 0·15}{0·75}$ or, $60-x = 12$

or, $x = 48$ hours.

B also takes 48 hours to complete the job. Thus, time saved by him is (60−48) or 12 hours.

Under the Halsey-Weir system, his total wages

= time taken × time rate + $\frac{40}{100}$ (time saved × time rate)

= 48 × 0·75 + $\frac{40}{100}$ (12 × 0·75)

= 36 + $\frac{40}{100}$ × 9

= 36 + 3·60 = Rs. 39·60.

Effective Hourly rate of *B* = $\frac{\text{Rs. }39·60}{48}$ = Rs 0·825.

Problem 30.

In a factory two workmen *A* and *B* produce the same product using the same material. Their normal wage rate is also the same. They are paid bonus according to Rowan system. The time allowed to the product is 40 hours. *A* takes 25 hours and *B* takes 30 hours to finish the product. The factory cost of the product for *A* is Rs. 193·75 and that for *B* is Rs. 205. The factory overhead rate is Re. 1 per man-hour. Find the normal rate of wages and the cost of materials used for the product.

(I. C. W. A.—Inter.)

Solution :

Let the normal rate of wages be *w* per hour · and the cost of materials used be *m* per unit.

Factory overhead—
for *A* = 25 hours @ Re. 1·00 or Rs. 25·00
for *B* = 30 hours @ Re. 1·00 or Rs. 30·00

Labour cost —
for *A* = Rs. 193·75 − Rs. 25·00 − *m* = Rs. 168·75 − *m*
for *B* = Rs. 205·00 − Rs. 30·00 − *m* = Rs. 175·00 − *m*

Under the Rowan system total wages

= time taken × time rate + $\frac{\text{time saved}}{\text{time allowed}}$ (time taken × time rate).

Hence total wages—
for *A* = 25 × *w* + $\frac{15}{40}$ (25 × *w*) = 25*w* + 9·375*w* = 34·375*w*
for *B* = 30 × *w* + $\frac{10}{40}$ (30 × *w*) = 30*w* + 7·5*w* = 37·5*w*

Now—
34·375 *w* = 168·75 − *m* ......(i)
and 37·500 *w* = 175·00 − *m* ......(ii)

Subtracting (i) from (ii) we get,
3·125*w* = 6·25 or, *w* = Rs. 2

Substituting the value of *w* in equation (ii) we get, 37·5 × 2 = 175 − *m*
or, 75 = 175 − *m* or, *m* = Rs. 100.

Problem 3

From the particulars given below, calculate the labour cost per man-day of 8 hours :

(a)	Basic salary	Rs. 2 per day.
(b)	Dearness allowance	25 paise per every point over 100 Cost of Living Index for working class—Current Cost of Living Index 700 points.
(c)	Leave salary	10% of (a) and (b)
(d)	Employer's contribution to provident fund	8% of (a), (b) and (c)
(e)	Employer's contribution to State Insurance	2·5% of (a), (b) and (c)
(f)	Expenditure on amenities to labour	Rs. 20 per head per mensem
(g)	Number of working days in a month	25 days of 8 hours each.

<div align="right">(<i>I. C. W. A.—Inter.</i>)</div>

Solution :

<div align="center">Statement of Labour Cost per man-day</div>

			Rs.
(a)	Basic salary	...	2·00
(b)	Dearness allowance : $600 \times 0.25 \times \frac{1}{25}$	...	6·00
(c)	Leave salary : 10% of (a) and (b)	...	0·80
(d)	Employer's contribution to Provident Fund : 8% of (a), (b) and (c)	..	0·70
(e)	Employer's contribution to State Insurance : 2·5% of (a), (b) and (c)	...	0·22
(f)	Expenditure on amenities : Rs. $20 \times \frac{1}{25}$	...	0·80
	Labour cost per man-day	...	10·52

Problem 32.

Calculate the standard labour hour rate for a workman of Grade III from the following data :

Basic Pay	Rs. 200 p.m.
D.A.	Rs. 150 p.m.
Fringe benefits	Rs. 100 p.m.

Number of working days per year—300 (of 8 hrs. each)

Leave rules :   30 days privilage leave with full pay
                20 days sick leave with half pay

Usually privilage leave and sick leave are availed of. What would be the labour cost per hour if no sick leave is availed of during the year.

<div align="right">(<i>I. C. W. A. Inter.—Adapted</i>)</div>

Solution :

	Monthly	*Annual*
	Rs.	Rs.
Basic pay	200	2,400
D. A.	150	1,800
Fringe benefits	100	1,200
	450	5,400

Less : Sick leave availed of (20 days) : $\frac{1}{2} \times \frac{20 \times \text{Rs. } 450}{30}$ — 150[1]

Annual labour cost — 5,250

Effective working hours : $(300 - 30 - 20)$ or, 250 days of 8 hours each = 2,000 hours.

Standard labour hour rate = $\frac{\text{Rs. } 5,250}{2,000}$ = Rs. 2·625

If no sick leave is availed of, the labour cost will be Rs. 5,400 and effective working hours will be $(300 - 30)$ or, 270 days of 8 hours each = 2,160 hours.

Labour cost per hour = $\frac{\text{Rs. } 5,400}{2,160}$ = Rs. 2·50

Note : [1]Pay deduction for sick leave has been computed at the monthly rate taking 30 days a month.

Problem 33.

A contractor uses a labour group of two skilled and three unskilled workers to do small contract jobs. The contractor wishes to charge out the work done by this group on an hourly basis. The information for the group is as follows :

	One skilled worker	*One unskilled worker*
Working hours per week	40	40
Normal idle time	10% of working hours	10% of working hours
Holidays per annum	Three weeks on full pay plus bonus of Rs. 200 per annum	Three weeks on full pay
Wage rate per hour	Rs. 2·40	Rs. 1·60
Food allowance per working week	Rs. 12·00	Rs. 8·00
Lodging allowance per working week	Rs. 18·00	Rs. 12·00
Non-contributory pension fund—employer's payment per annum	Rs. 106·00	

You are required to calculate a labour hour rate for the group assuming fifty two weeks per year.

Solution :

	Skilled Rs.	Unskilled Rs.
Wages : Rs. 2·40 × 40 × 52	4,992	
Rs. 1·60 × 40 × 52		3,328
Holiday bonus	200	—
Food allowance (49 weeks)	588	392
Lodging allowance (49 weeks)	882	588
Pension fund	106	
	6,768	4,308

	Rs.
Total wages cost : Rs. 6,768 × 2 (workers)	13,536
Rs. 4,308 × 3 (workers)	12,924
	26,460
Working hours : 49 weeks × 40 hours	1,960
Less : Idle time @ 10%	196
Effective hours of work	1,764
Effective labour hours : 1,764 × 5 (workers)	8,820

∴ Labour rate $\dfrac{\text{Rs. } 26,460}{8,820}$ = Rs. 3·00 per man-hour (or Rs. 15 per group-hour)

Problem 34.

A light engineering factory has two production shops. Initially it was decided to recover the direct wages (both basic wages and dearness allowance) at Re. 0·50 and Re. 0·65 per hour respectively. The management subsequently desired to include for recoveries of other benefits at 1¼ per cent towards E. S. I., 8⅜ per cent towards provident fund, 12½ per cent towards other concessions, on total wages. The total hours booked to the jobs amounted to 22.000 hours and 24,600 hours respectively. The wages bill including all benefits for the period came to Rs. 17,482 and Rs. 25,725 respectively. Calculate the amount of wages recovered and state how you would treat the difference.

Solution :

	Shop 1	Shop 2
Basic wages & D.A.	Re. 0·5000	Re. 0·6500
E. S. I. @ 1¼%	0·0062	0·0081
Provident Fund @ 8⅜%	0·0417	0·0542
Other concessions @ 12½%	0·0625	0·0812
Revised rate of recovery per hour	Re. 0·6104	Re. 0·7935
Total hours booked	22,000	24,600
Total wages recovered—		
22,000 × Re. 0·6104	Rs. 13,429	—
24,600 × Re. 0·7935	—	Rs. 19,520
Actual wages paid	Rs. 17,482	Rs. 25,725
Difference being under-recovery	Rs. 4,053	6,205

The amount of under-recovery may be included in the overheads of the respective departments to be recovered from jobs as a percentage of direct wages.

Problem 35.

Calculate the earnings of workers *A* and *B* from the following particulars for a month, and allocate the earnings of each to jobs *X*, *Y* and Z.

		A	*B*
(a)	Basic wages	Rs. 100	Rs. 10
(b)	Dearness Allowance	50%	55%
(c)	Provident Fund (on basic wages)	8%	8%
(d)	Employees' State Insurance (on basic wages)	2%	2%
(e)	Overtime work	10 hrs.	
(f)	Idle time and leave	—	16 hrs.

The normal working hours for the month is 200 hours. Overtime is paid for at double the normal rate of wage plus D A. Employer's contributions to State Insurance and Provident Fund are at equal rates with the employees' contribution. The month contains 25 working days, and one paid holiday.

The two workers were employed on jobs *X*, *Y* and Z in the following proportion :

<div align="center">Jobs</div>

	X	*Y*	Z
A	40	30	30
B	50	20	30

Overtime was done on job *Y*. (*I. C. W. A.—Inter.*)

Solution :

(1) Calculation of rate per hour

		A Rs.		*B* Rs.
Basic wages		100·00		100·00
Dearness Allowance :	50%	50·00	55%	55·00
Provident Fund :	8% on basic	8·00	8% on basic	8·00
Employee's State Insurance :	2% on basic	2·00	2% on basic	2·00
		Rs. 160·00		Rs. 165·00
Normal working hours for the month		200		200

Normal rate per hour : $\dfrac{\text{Rs. } 160\cdot00}{200}$ or Re. 0·80 $\dfrac{\text{Rs. } 165}{200}$ or Re. 0·825

Overtime rate per hour : $2 \times \dfrac{\text{Rs. } 150\cdot00}{200} = \text{Rs. } 1\cdot50$: $2 \times \dfrac{\text{Rs. } 155\cdot00}{200} = \text{Rs. } 1\cdot55$

(2)   Allocation of labour time to jobs

	Job X Hrs.	Job Y Hrs.	Job Z Hrs.
A : 200 hrs. in the ratio of 40 : 30 : 30	80	60	60
Overtime	—	10	—
B : (200—16) or 184 hrs. in the ratio of 50 : 20 : 30	92	36·8	55·2

(3)   Calculation of earnings of workers and allocation to jobs

	Job X	Job Y	Job Z	Total
A—Normal wages	80×0·80 =Rs. 64·00	60×0·80=Rs. 48·00	60×0·80 = Rs. 48·00	Rs. 160·00
—Overtime wages	—	10×1·50=Rs. 15·00	—	Rs. 15·00
				Rs. 175·00
B—Normal wages	92×0·825=Rs. 75·90	36·8×0·825 = Rs. 30·36	55·2×0·825 = Rs. 45·54	Rs. 151·80
—Idle time and leave[1] wages (16×0·825)		—	—	Rs. 13·20
	Rs. 139·90	Rs. 93·36	Rs. 93·54	Rs. 165·00

Note :   [1]Idle time and leave wages will not be charged to the jobs. but will be recovered as overhead.

Problem 36.

Calculate the normal and overtime wages payable to a workman on the basis of the following particulars :

Days		*Hours worked*
Monday	...	9
Tuesday	...	8
Wednesday	...	10
Thursday	...	11
Friday	...	9
Saturday	...	5

Normal working hours are 8 hours per day and the normal rate of wages is Rs. 1·25 per hour.   Overtime pay is at the undernoted rate :

Upto 9 hours in a day at single rate and over 9 hours in a day at double rate, or upto 48 hours in a week at a single rate and over 48 hours at double rate whichever is more beneficial to the workman.

(C. U., B. Com. Hons.)

Solution :

Statement analysing hours worked

Days	Total Hours Worked	Normal	Overtime	
			Single Rate	Double Rate
Monday	9	8	1	--
Tuesday	8	8	--	-
Wednesday	10	8	1	1
Thursday	11	8	1	2
Friday	9	8	1	—
Saturday[1]	5	5	—	—
	52	45	4	3

	Rs.	Rs.
Normal wages : 45 hours @ Rs. 1·25		56·25

Overtime wages—

	Rs.	
Single rate : 4 hours @ Rs. 1·25	5·00	
Double rate : 3 hours @ Rs. 2·50	7·50	
		12·50
	Total wages	68·75

Alternative basis Rs.

	Rs.
48 hours at single rate of Rs. 1·25	60·00
4 hours at double rate of Rs. 2·50	10·00
Total wages	70·00

Wages shall be paid according to the alternative basis (i.e.. Rs. 70) as this is more beneficial to the workman.

Note : [1]Assumed that Saturday is a full working day.

Problem 37.

Compute the direct labour cost of Job "*A*" from the following data :

Job "*A*"

Time employed in hours		*Worker X*	*Worker Y*
Monday	...	10	8
Tuesday	...	9	10
Wednesday	...	10	11
Thursday	...	11	10
Friday	...	6	5
Saturday	...	6	4

(a) Normal working hours on week days are 8 hours and on Saturday, 4 hours.

(b) Overtime is paid for at double the normal rates.

(c) Normal rates of daily wages : X—Rs. 6, Y—Rs. 4

(d) Four hours' work on Saturday is paid for at full day's wages. Work on Saturday in excess of 4 hours is treated as overtime and is paid

for at $1\frac{1}{2}$ times the normal rates up to a total of 8 hours' work and beyond that at double the normal rate.

(e) D. A. has to be added to the total wages including overtime, at 50% of wages.   (*I. C. W. A. Inter.—Adapted*)

Solution :

Statement analysing hours worked

Day	Hours worked x	Hours worked y	Normal hours x	Normal hours y	Overtime hours x Double Rate	Overtime hours x One and half Rate	Overtime hours y Double Rate	Overtime hours y One and half Rate
Monday	10	8	8	8	2	—	—	—
Tuesday	9	10	8	8	1	—	2	—
Wednesday	10	11	8	8	2	—	3	—
Thursday	11	10	8	8	3	—	2	—
Friday	6	5	6	5	—	—	—	—
Saturday	6	4	8(4)[1]	8(4)[1]	—	2	—	—
Total	52	48	46	45	8	2	7	—

Note : [1]On Saturday 4 hours' work is equivalent to 8 hours' work, because attendance for 4 hours on this day is treated as normal day of 8 hours.

Computation of Direct Labour Cost of job 'A'

X—Normal wages : 46 hours @ Re. 0·75[1] per hour	Rs. 34·50	
Overtime wages :		
Double rate : 8 hours @ Rs. 1·50 per hour	Rs. 12·00	
One and half rate : 2 hours @ Rs. 1·125 per hour	Rs. 2·25	
	Rs. 48·75	
D. A.—50% of Rs. 48·75	Rs. 24·38	
		Rs. 73·13
Y—Normal wages : 45 hours @ Re. 0·50[1] per hour	Rs. 22·50	
Overtime wages :		
Double rate : 7 hours @ Re. 1·00 per hour	Rs. 7·00	
	Rs. 29·50	
D.A.—50% of Rs. 29·50	Rs. 14·75	
		Rs. 44·25
Total		Rs. 117·38

Note : [1]Normal hourly wages—

$$X : \frac{Rs. \ 6}{8} \ \text{or} \ Re. \ 0·75$$

$$Y : \frac{Rs. \ 4}{8} \ \text{or} \ Re. \ 0·50$$

Problem 38.

Milling section of a factory engages 25 direct workers. During the month of April 1982, they were paid for 4,800 normal attendance hours at an average rate of Rs. 1·50 per hour. In addition, they also worked for

400 overtime hours at double rate. The overtime was necessitated by abnormal circumstances in February, 1982 For the purpose of reckoning labour cost, 40% is to be added to gross wages for fringe benefits. From the following particulars work out the total labour cost and allocate it to different cost elements etc.

   (a) Hours booked to jobs   4,200
   (b) Allowed idle time $12\frac{1}{2}$%
   (c) There was no incidence of abnormal idle time. Actual idle time was exactly in accordance with standard set for the purpose.

Solution :

Normal Attendance Hours	4,800
Overtime Hours	400
Total Working Hours	5,200

Normal idle time : $12\frac{1}{2}$% of 4,800[1] hours or 600 hours which is equal to the actual idle time i.e., (4,800 - 4,200) or 600 hours.

Note : [1]Idle time has been calculated on the basis of normal attendance hours, also assumed that overtime hours did not have any idle time.

Total Labour Cost   **Rs.**

Normal wages : 5,200 hours @ Rs. 1·50 per hour	7,800[2]
Overtime premium : 400 hours @ Rs. 1·50 per hour	600
Gross wages	8,400
Add : Fringe benefit : 40% of 8,400	3,360
Total	Rs. 11,760

Allocation

	Rs.	Rs.
To be charged as Direct Labour		
Wages for time spent on production (4,200+400) or 4,600 hrs. @ Rs. 1·50	6,900	
Add : Fringe benefit @ 40%	2,760	9,660
To be charged to Costing Profit & Loss A/c[3]		
Overtime premium 400 hrs. @ Rs. 1·50	600	
Add : Fringe benefit @ 40%	240	840
To be charged as Production Overhead (Standing Order No...)		
Wages for normal idle time : 600 hrs. @ Rs. 1·50	900	
Add : Fringe benefit @ 40%	360	1,260
Total		11,760

Note : [2]Rs. 7,800 includes wages for overtime work at normal rate. Excess of overtime rate over normal rate is overtime premium.

[3]Since overtime was necessitated by abnormal circumstances, overtime premium should be written off to Costing Profit & Loss A/c.

Problem 39.

An analysis of the time card of a worker on a machine shows that, of the total 48 hours, he worked 45 hours (including 4 hours overtime) on production and that 3 hours was idle time due to machine breakdown.

The rate of the worker is Re. 1 per hour ; but overtime is paid at 50 per cent extra.

You are required to allocate the total wages paid to the worker between 'direct' and 'indirect' labour, indicating reasons therefor.

Solution :

Amount of wages paid to the worker	Rs.
Normal wages : 48 hours @ Re. 1 per hour	48
Overtime premium : 4 hours @ Re. 0·50 per hour	2
Total	Rs. 50

Allocation	Rs.
Wages for time spent on production to be charged as direct .	
45 hours @ Re. 1	45
Overtime premium to be written off to Costing Profit & Loss A/c	2
Abnormal idle time to be charged to Costing Profit & Loss A/c :	
3 hours @ Re. 1	3
Total	Rs. 50

Overtime premium may be considered as indirect (viz., a part of factory overhead) on the assumption that overtime was necessitated due to a temporary increase in work. If overtime is worked due to the customer's specific request to expedite delivery, overtime premium is to be charged as direct wages to the job. If, on the other hand, overtime is worked due to abnormal factors (e.g., breakdown of machine, flood, earthquake etc.), the overtime premium is to be charged to Costing Profit & Loss A/c. In this case it is assumed that overtime work was required for the loss of normal working time due to breakdown of machinery.

Idle time due to breakdown of machinery is abnormal in nature. Hence it has to be charged to Costing Profit & Loss A/c.

Problem 40.

A manufacturing concern's basic wage rate is Rs. 2 per hour and it pays evening overtime and holiday overtime at one and a half times and twice the basic rate respectively. In a year the normal working hours, evening overtime and holiday overtime amounted to 3,8_,000 hours, 35,000 hours and 50,000 hours respectively. In each of the following circumstances calculate the labour cost chargeable to a job which required normal time, evening overtime and holiday overtime of 10,000 hours, 1,200 hours and 100 hours respectively

    (i) If overtime is worked regularly throughout the year as a matter of policy due to labour shortage.

(ii) **If overtime is worked irregularly to meet spasmodic production requirements.**

(iii) **If overtime is worked specifically at the customer's request to expedite delivery.**

Give reasons for your answer. (*C. U., B. Com. Hons.—Adapted*)

Solution :

Basic wage rate	Rs. 2 per hour
Evening overtime rate Rs. ($2.00 \times \frac{3}{2}$)	Rs. 3 per hour
Holiday overtime rate Rs. (2.00×2)	Rs. 4 per hour

Total wages for the year

	Rs.
Normal time : 3,85,000 hrs. @ Rs. 2	7,70,000
Evening overtime : 35,000 hrs. @ Rs. 3	1,05,000
Holiday overtime : 50,000 hrs. @ Rs. 4	2,00,000
4,70,000	10,75,000

Average wage rate for the year $\dfrac{\text{Rs. } 10,75,000}{4,70,000} = \text{Rs. } 2.288$

First Case

Since overtime is a regular feature here and has been taken as a matter of policy due to labour shortage, the job should be charged for the total hours worked (i.e., normal time + evening overtime + holiday overtime) at the *average wage rate* for the year, because it is not proper to charge a job which has been done during overtime hours at a higher rate and to charge another job which has been done during normal hours at a lower rate

∴ The labour cost chargeable to the job will be :

(10,000 + 1,200 + 100) or 11,300 hrs. @ Rs. 2.288 = Rs. 25,854.40

Second Case

Since overtime is temporary and irregular feature here just to meet spasmodic production requirements. the job should be charged for the total hours worked (i.e., normal time + evening overtime + holiday overtime) at the *basic wage rate* and the overtime premium should be considered as production overhead to be recovered on some equitable basis.

∴ The labour cost chargeable to the job will be :

11,300 hrs. @ Rs. 2 = Rs. 22,600.

Third Case

Since overtime, in this case, is worked due to the customer's specific request to expedite delivery, it is proper to charge the normal wage and overtime premium directly to the job.

∴ The labour cost chargeable to the job will be :

	Rs.
10,000 hrs. @ Rs. 2	20,000
1,200 hrs. @ Rs. 3	3,600
100 hrs. @ Rs. 4	400
	24,000

Problem 41.

Bengal Printers Ltd., operate a printing press. During March 1982, that plant was operating at full capacity. The material and labour costs of Job No. 1001, and all other jobs worked on, in March, are shown below :

	Job 1001	All other jobs	Total
	Rs.	Rs.	Rs.
Materials	10,000	70,000	80,000
Direct Labour	12,000	28,000	40,000
Overtime Premium	4,000	—	4.000

In addition to the foregoing costs, factory overhead incurred in March, '82 amounted to Rs. 44,000. Overhead is allocated to production on the basis of direct labour costs.

You are required to (i) show what the factory profit or loss on Job No. 1001 would be, using two different methods of accounting for overtime premium. Assume that the contract price for this job is Rs. 40,000 : (ii) indicate under what circumstances each method should be used : (iii) state whether the profit or loss of the company during March, 1982 would be affected by the choice of one method or the other.

Solution :

(i) Profit/Loss on Job No. 1001 considering overtime premium as Direct Labour Cost :

	Rs.
Material	10,000
Direct labour (12,000+4,000)	16,000
Overhead (100% of Direct labour)[1]	16,000
Total cost	42,000
Contract price	40,000
Loss	2,000

Note : [1]Total Direct labour cost including overtime premium is Rs. (40,000 + 4,000) or Rs. 44,000 and total overhead is Rs. 44,000. Hence percentage of overhead to Direct labour is $\frac{44,000}{44,000} \times 100$ or 100%.

Profit/Loss on Job No. 1001 considering overtime premium as part of overhead :

	Rs.
Material	10,000
Direct labour	12,000
Overhead (12% of Direct labour)[2]	14,400
Total cost	36,400
Contract price	40,000
Profit	3,600

Notes : [2]Total Direct labour cost is Rs. 40,000 and total Overhead is Rs. (44,000+4,000) or Rs. 48,000. Hence percentage of Overhead to Direct labour is $\frac{48,000}{40,000} \times 100$ or 120%.

(ii) If overtime has to be paid specifically for a job (e.g., when at the customer's request it is to be completed before the normal date of delivery agreed upon), the amount of overtime premium is considered as direct labour and added to the cost of the job for being recovered from the customer concerned. If, on the other hand, overtime has to be paid due to a temporary increase in the volume of work, the amount of overtime premium should be considered as part of production overhead for being allocated to different jobs on some equitable basis.

(iii) The profit or loss of the company for March '82 will not be affected by the choice of the method because the total cost for the month remains the same [i.e., Rs. 80,000+40,000+4,000+44,000) or Rs. 1,68,000].

Problem 42.

The following information relates to the week ending on 25th November, 1982, for two workers viz., *A* and *B* :

Employee	A	B
Work issued (units)	1,800	3,168
Bonus time allowed	30 mts. per dozen	3 hours per gross
Output rejected	444	756
Basic hourly wage rate	Rs. 4	Rs. 6
Hours worked	48	54

Bonus is paid @ $\frac{3}{4}$ of the basic rate for all time and for all output without any deductions for rejected output. The basic working week is 42 hours, the first 6 hours of overtime being paid at time plus one-third and the next six hours at time plus one-half.

Using the information given above, present in a tabulated summary form for each employee :

(a) Number of bonus hours earned and amount of bonus earned ; (b) basic wages including overtime premium and gross wages and (c) direct wages cost per dozen of finished output (nearest paise) when overtime is worked—(i) regularly throughout the year as company policy due to labour shortage and (ii) specifically at the customer's request to expedite delivery.

(I. C. W. A.—Inter.)

Solution :

	A	B
Hours worked	48	54
Normal hours	42	42
Overtime hours	6	12
Time allowed $\left(\frac{1,800}{12}\times\frac{30}{60}\right)$	75 hrs. $\left(\frac{3,168}{144}\times\frac{180}{60}\right)$	66 hrs.
Time taken	48 hrs.	54 hrs.
Time saved	27 hrs.	12 hrs.
Units produced	1,800	3,168
Rejects	444	756
Accepted units	1,356	2,412
Accepted units in dozen (1,356÷12)	113 (2,412÷12)	201

		A Rs.		B Rs.
Basic wages	(48 × Rs. 4)	192	(54 × Rs. 6)	324
Overtime premium (6 × ⅓ × Rs. 4)		8	6 × ⅓ × Rs. 6⎱ 6 × ½ × Rs. 6⎰	12⎱ 18⎰
Bonus	(⅔ × 27 × Rs. 4)	72	(⅔ × 12 × Rs. 6)	48
Gross wages		272		402

Direct wages cost :

    (a) When overtime is worked as a company policy :

Basic wages	192	324
Bonus	72	48
Total	264	372

        Direct wages cost/dozen

$$(264 \div 113) \quad \text{Rs. } 2\cdot34 \quad (372 \div 201) \quad \text{Rs. } 1\cdot85$$

Note : When overtime is worked regularly throughout the year as a company policy due to labour shortage, average hourly rate of wages for the whole year should be ascertained (taking into consideration wages for normal as well as overtime hours), and wages at this average rate should be charged to a job as direct wages for the total hours worked thereon. This problem, however, does not provide information for determining average rate of wages for the year. Hence for the purpose of answering this problem overtime premium has been treated as works overhead.

    (b) When overtime is worked at customer's request :

        Direct wages cost/dozen

$$(272 \div 113) \quad \text{Rs. } 2\cdot41 \quad (402 \div 201) \quad \text{Rs. } 2\cdot00$$

Note : When overtime is worked at the specific request of the customer, overtime premium will be treated as direct wages.

Worker	Bonus Hours earned	Amount of bonus Rs.	Basic wages Rs.	Overtime premium Rs.	Gross wages Rs.	Direct wages when O.T. is regular		Direct wages when O.T. at customer's request	
						Total Rs.	Per dozen Rs.	Total Rs.	Per dozen Rs.
A	27	72	192	8	272	264	2·34	272	2·41
B	12	48	324	30	402	372	1·85	402	2·00

Problem 43.

Re : Labour Turnover

    The management of a company are worried about their increasing labour turnover in the factory and before analysing the causes and taking remedial steps, they want to have an idea of the profit foregone as a result of labour turnover in the last year.

Last year sales amounted to Rs. 83,03,300 and the P/V ratio was 20 per cent. The total number of actual hours worked by the direct labour force was 4·45 lakhs. As a result of the delays by the Personnel Department in filling vacancies due to labour turnover, 1,00,000 potentially productive hours were lost. The actual direct labour hours included 30,000 hours attributable to training new recruits, out of which half of the hours were unproductive.

The costs incurred consequent on labour turnover revealed on analysis the following :

	Rs.
Settlement cost due to leaving	43,820
Recruitment costs	26,740
Selection costs	12,750
Training costs	30,490

Assuming that the potential production lost as a consequence of labour turnover could have been sold at prevailing price, find the profit foregone last year on account of labour turnover.

Solution :

Actual direct labour hours worked	4,45,000
Less : Unproductive training hours ($\frac{1}{2} \times 30,000$)	15,000
Actual productive hours	4,30,000

Sales per productive hour $= \dfrac{\text{Rs. } 83,03,300}{4,30,000} = \text{Rs. } 19\cdot31$

Potential productive hours lost $= 1,00,000$

Loss of potential sales $= 1,15,000 \times \text{Rs. } 19\cdot31 = 22,20,650$

Loss of productive hours :

for replacement	1,00,000 hrs.
for training	15,000 hrs.
	1,15,000 hrs.

Contribution foregone $=$ Loss of potential sales $\times$ P/V ratio

$$= 22,20,650 \times 20\% = \text{Rs. } 4,44,130$$

Statement of Profit foregone

	Rs.
Contribution foregone	4,44,130
Settlement cost due to leaving	43,820
Recruitment costs	26,740
Selection costs	12,750
Training costs	30,490
Total profit foregone due to labour turnover	5,57,930

Cost (Part I)—16

Problem 44.

A company has the following income statement for the year ended 31st March, 1986 :

	Rs.	Rs.
Sales		12,00,000
Less : Variable costs		
Materials	3,50,000	
Direct labour	2,50,000	
Variable overhead	2,00,000	8,00,000
Marginal contribution		4,00,000
Less : Fixed overhead		1,60,000
Profit		2,40,000
Capital invested		10,00,000

The actual number of hours of direct labour worked in the year under review was 1,02,000. As a consequence of delays in filling vacancies of employees who quit, 3,000 potential direct hours were not worked, and included in the actual hours worked were 4,000 hours of trainees, half of which time was unproductive. The costs incurred in consequence of re-employment was as follows :

Separation costs	16,500
Selection costs	20,400
Recruitment costs	12,600
Training costs	24,500

Calculate (i) the profits lost or foregone on account of labour turnover ; (ii) the potential return on capital and sales ; and (iii) turnover ratio.

Solution :

Actual direct labour hours worked		1,02,000
Less : Unproductive training hours ($\frac{1}{2} \times 4,000$)		2,000
Actual productive hours		1,00,000

Sales per productive hour $= \dfrac{12,00,000}{1,00,000} =$ Rs. 12

Loss of productive hours :	
for replacement	3,000 hrs.
for trainees	2,000 hrs.
	5,000 hrs.

Loss of potential sales = 5,000 × s. 12 = Rs. 60,000

Assuming that the ratio of marginal contribution to sales would remain same, the contribution foregone = Rs. 60,000 × $\dfrac{4,00,000}{12,00,000}$ = Rs. 20,000.

(i) *Profit lost or foregone* :	Rs.
Contribution foregone	20,000
Separation costs	16,500
Selection costs	20,400
Recruitment costs	12,600
Training costs	24,500
	94,000

Potential profit = Rs. 2,40,000 + Rs. 94,000 = Rs. 3,34,000

Potential sales = Rs. 12,00,000 + Rs. 60,000 = Rs. 12,60,000

Potential labour hours = 1,00,000 hrs. + 5,000 hrs. = 1,05,000 hrs.

(ii) (a) *Potential return on capital—*

$$= \frac{\text{Potential profit}}{\text{Capital invested}} \times 100 = \frac{3,34,000}{10,00,000} \times 100 = 33 \cdot 4\%$$

(b) *Potential return on sales* $= \dfrac{\text{Potential profit}}{\text{Potential sales}} \times 100$

$$\frac{3,34,000}{12,60,000} \times 100 = 26 \cdot 5\%$$

(iii) *Turnover ratio* $= \dfrac{\text{Labour hours lost}}{\text{Potential labour hours}} \times 100$

$$= \frac{5,000}{1,05,000} \times 100 = 4 \cdot 76\%$$

EXERCISE

Theoretical

1. Discuss the different methods of recording attendance of workers in a factory.
   (*C. U., B. Com. Pass '84*)

2. Describe the following methods for recording daily attendance of workmen :
   (a) Master roll ; (b) Disc. method ; (c) Time recording card.

3. Write short notes on :
   (a) Job Card ; (b) Clock Card ; (c) Idle Time Card ; (d) Piece-work Card.

4. What is Labour Turnover ? How is it measured ? What are its causes and its effects on labour co⁻ How can it be reduced ?

5. Explain the term "Idle time" and discuss how it should be dealt with for Cost Accounting purposes.
   (*C. U. B. Com. Hons.*)

6. What is "Idle time" ? How do you classify idle time into normal and abnormal ? State how each class of such idle time cost is treated in cost accounts.
   (*C. U., B. Com. Hons. '85*)

7. What is "Idle time" ? How is it classified ? Can idle time be controlled effectively and if so, how ?
   (*C. U., B. Com. Hons.*)

8. Describe the essential characteristics of a good system of wage payment.

9. What are the advantages and disadvantages of time rate and piece rate systems of wage payment ? Under what circumstances each system will be effective ? Give reasons.

10. (a) Tabulate the advantages and disadvantages of remunerating employees by using piece work rate.
    (b) Explain briefly the idea of a premium bonus scheme, giving three examples.

11. Explain the fundamental differences between :
    (a) Straight Piece-work,
    (b) Differential Piece-work,
    (c) Halsey scheme of premium bonus, and
    (d) Rowan scheme of premium bonus.

Assuming your own figures, show the earnings of workers under the above four different schemes for a given period.

12. (a) Discuss the general principles which should be applied to incentive schemes.

   (b) Certain organisations, for example, car manufacturers, have abandoned premium bonus schemes and piece-work schemes and substituted a high day rate system. List the advantages and disadvantages expected from following such a policy.

13. Explain any two methods of paying bonus to factory workers and critically examine the advantages and disadvantages of one of them in a big manufacturing concern.   *(C. U., B. Com. Hons.)*

14. Describe any two incentive plans for remunerating labour. Explain how the employers also derive benefit from the use of it.   *(C. U., B. Com. Pass '85)*

15. Discuss the principles of 'Premium Bonus Plans'. Describe the salient features of 'Rowan Plan' and 'Halsey Plan' with illustrations.   *(C. U., B. Com. Hons.)*

16. What is meant by a 'Premium Bonus Scheme' in remunerating labour ? Distinguish between the individual system and the group system, and discuss their merits and demerits. State also as to what should be the essential characteristics of a satisfactory bonus scheme.   *(C. U., B. Com. Hons.)*

17. What do you mean by a premium bonus scheme of remunerating labour ? Explain with illustration any one of the premium schemes that you are acquainted with.   *(C. U., B. Com. Hons.)*

18. What do you mean by 'Group Bonus Scheme' ? Discuss its advantages and disadvantages.   *(C. U., B. Com. Hons.)*

19. Describe any two of the different schemes of Incentive Wage Payments in common use. Illustrate your answers with assumed data.

20. Describe in details a system of payment of wages in a large factory, showing clearly the safeguards you would employ against fraud or theft.   •

                                                   (C. U., B. Com. Hons.)

21. What do you understand by 'time study' ? In what way it is connected with remuneration of labour ?

22. Discuss how 'Overtime Wages' should be treated in cost accounting.

                                                (C. U., B. Com. Pass '84)

23. For each of the labour costs given below, state the accounting treatment that you would recommend, giving your reasons :

   (a) Idle time caused by an explosion in the factory.

   (b) Idle time in the finishing department because of delayed production in the assembly department.

   (c) Holiday pay.

   (d) Overtime in the lubricating department caused by general pressure of work.

   (e) Overtime in the lubricating department due to a mix up in holiday allocations by the departmental manager.

   (f) Overtime resulting from a customer saying, 'I want this job done in a week, and if you have to work overtime, I don't mind'.

   (g) Supervisors' wages.

   (h) Labour time involved in reworking 5 units out of a batch of 50, on a process where 10% of completed units are expected to be defective.

24. (a) Write short notes on the following—(i) Overtime, (ii) Labour turnover, (iii) Production incentives, (iv) Motion study.

   (b) How would you control overtime payments ?

25. How would you treat in cost accounts—(a) overtime cost, (b) idle time cost ? What safeguards would you suggest to control them ?

26. Discuss the steps to be taken to prevent fraud in wage payment.

27. What do you mean by 'overtime premium' ? How overtime premium paid to Direct Labour should be treated in cost accounts ?

Practical

1. From the following particulars, calculate the earnings of workers *X* and *Y* for a day under (a) Straight Piece Rate system and (b) Taylor's Differential Piece Rate system :

Standard production	10 units per hour
Normal time rate	50 paise per hour
Differentials to be applied :	

80% of piece rate below standard

120% of piece rate at or above standard

Hours of the day :	8	
Output *X*	:	75 units
Y	:	100 units

2. Calculate total monthly remuneration of workers *A*, *B*, *C* and *D* on the basis of the following information for the month of December, 1980 :

(i) Standard production for each worker—1,000 units.

(ii) Rate of wage—10 paise per unit.

(iii) Bonus—Rs. 5 for each 1% increase over 90% of the standard.

(iv) Dearness Allowance per month—100% of piece wage

The units completed by the four workers were as under :

A :	950 units ;	*B* :	900 units ;
C :	960 units :	*D* :	850 units.

(*C. U., B. Com. Hons. '81*)

3. Wage negotiations are going on with the recognised labour union and the management wants you as the cost accountant of the company to formulate an incentive scheme with a view to increasing productivity.

The cases of three typical workers Sonal, Madhu and Batuk who produce respectively 180, 120 and 100 units of the company's product in a normal day of 8 hours are taken up for study.

Assuming that day wages would be guaranteed at 75 paise per hour and the piece rate would be based on a standard hourly output of 10 units, calculate the earnings of each of the three workers and the labour cost per 100 pieces under (i) Day wage; (ii) Piece rate, (iii) Halsey Scheme and (iv) The Rowan Scheme.

Also calculate under the above schemes the average cost of labour for the company to produce 100 pieces.

4. An employee working under a bonus scheme saves 10 hours in a job for which the standard time is 60 hours. Calculate the rate per hour worked and wages payable to a worker, if incentive bonus of 10% on the hourly rate is payable when standard time (namely, 100% efficiency) is achieved, and a further incentive bonus of 1% on hourly rate for each 1% in excess of that 100% efficiency is payable.

Assume that the normal rate of payment is Rs. 5 per hour.

5. Bharat Shawl Works has introduced the following sliding scale for its workers :

Within the first 10% of saving in standard time, bonus is	40% of time saved
Within the next 20% of saving in standard time, bonus is	50% of time saved
Within the next 30% of saving in standard time, bonus is	60% of time saved
For the balance bonus is	75% of time saved

Sm. Rekha Pal, a worker whose rate per hour is Rs. 2, completed a particular job in 120 hours (time allowed 200 hours).

Compute her earning from the job.   (*C. U., B. Com. Hons.* '89)

6. Payment of wage bonus is made in a concern on the following scale on the basis of the percentage of time saved on time allowed.

Time saved (% of standard)	*Bonus (% of time saved)*
Upto 25%	10%
Above 25% and upto 35%	(i) plus 20% of time saved above 25% and upto 35%
Above 35%	(ii) plus 30% of time saved beyond 35%. •

Calculate the earnings of a worker (wage rate Rs. 1·20 per hour) who takes 50 hours to complete a job, the standard time allowed for which is 100 hours.   (*I. C. W. A. Inter.*)

7. Bharat Engineering Company remunerate their employees by the following system :

Guaranteed hourly rate Rs. 2·00 per hour. Standard output during a week consisting of 6 days of 8 hours each = 200 units.

Bonus :

Between 71% and 80% efficiency, 10% of time rate earnings. Between 81% and 100% efficiency, 20% of time rate earnings. Above 100% efficiency, an additional 1% of time rate earnings for every 1% increase in the efficiency above 100% efficiency.

In addition to above, the worker is paid dearness allowance at the rate of Rs. 1·50 per day irrespective of his efficiency. The following figures of output have been collected from the books of the company for the week ending on 24-5-1980 :

Name of the worker	*Output (units)*
Anand	120
Bhasheer	150
Chauhan	190
Devraj	240

Calculate the total earnings of each of the above workers showing the figures of bonus and dearness allowance separately.

8. A manufacturing enterprise has introduced a bonus system of wage payment on a slab rate based on cost reduction towards labour and overheads, the slab rates being :

Upto 10% saving	5% of the earning
,, 20% ,,	15% ,, ,, ,,
,, 40% ,,	30% ,, ,, ,,
,, 70% ,,	40% ,, ,, ,,
Above 70% ,,	50% ,, ,, ,,

The rates per hour of three workers X, Y and Z are Re. 0·50, Re. 0·60 and Re. 0·55 respectively. The overhead recovery rate is 500% on productive wages. The standard cost towards wages and overhead is determined at Rs. 1·20 per unit.

If the time taken by X, Y and Z to finish 100 units are 26, 30 and 20 hours respectively, what is the amount of bonus earned by each of the three workers ?

9. Describe the Halsey Premium Plan and determine on this basis the total earnings of a worker in the following case :

Standard time for the job	...	12 hours
Actual time taken	...	8 hours
Rate per hour	...	80 paise.

Do you consider the Halsey Plan an ideal plan ? Give reasons for your answer. (*C. U., B. Com. Hons.*)

10. What do you mean by 'Premium bonus method of payment of labour' ? In one case the allotted time for a job was 8 hours, but the worker concerned finished it in 7 hours. If the rate per hour is Rs. 4, what is the premium to be paid under the Rowan Premium Scheme ?

(*C. U., B. Com. Hons.*)

11. Calculate the effective hourly rate of labour wages in the following case where bonus is paid under the Rowan Premium Plan :

Basic rate of wages per hour	... Rs. 4·50
Time allowed for the job	... 20 hours
Time actually taken	... 16 hours

(*C. U., B. Com. Hons.*)

12. From the following details calculate the labour cost chargeable to Order No. 1579 in respect of an employee machining a casting, under (a) the Rowan scheme, and (b) the Halsey (50%) scheme.

Time allowed	5 hours 30 minutes
Time taken	4 hours 25 minutes
Rate of pay	Re. 0·60 per hour

13. Abdul and Basit work for a bicycle company making brake pedals. Details for the week ending 30th June are as follows :

	Abdul	*Basit*
Number of pedals made	100	50
Time allowed (Hours)	100	50
Time taken (,,)	40	40

Basic hourly rate for both Rs. 2·00

Calculate remuneration of both Abdul and Basit for the week, and their effective hourly rates, under :

(a) The Halsey 50/50 premium bonus scheme,
(b) The Rowan premium bonus scheme.

14. From the following data ascertain the total earnings of each worker separately under (*i*) Halsey and (*ii*) Rowan schemes of incentive payment :

(*a*) Worker	*A*	*B*	*C*
(*b*) Time allowed (hours)	3	4	5
(*c*) Actual time taken (hours)	5	3	3
(*d*) Basic rate of wages per hour (Rs.)	2	2	2

(C. U., B. Com. Pass '84)

15. From the following data calculate the earnings of a worker under (i) Halsey system (assuming 40% to worker) and (ii) Rowan system ·

Hourly rate of wages (guaranteed)   Rs. 1·50
Standard time for producing 1 dozen articles is 4 hours
Actual time taken by the worker for producing 10 dozen articles is 32 hours.

16. Ramhari does a job in 70 hours as against 100 hours allowed. His hourly rate is Rs. 2. He is entitled to dearness allowance of Rs. 8 per day of 8 hours. Calculate the wages payable under (i) Halsey Plan and (ii) Rowan Plan.   *(C. U., B. Com. Pass '82)*

17. Determine the wages payable to a worker during a 5-day week under the Halsey Premium Bonus system, with the following data :

Date of the week	*Actual Production units*	*Hours worked*
Monday	100	8
Tuesday	95	8
Wednesday	110	8
Thursday	120	8
Friday	125	8

Premium = 60% of time saved
Standard guaranteed hourly rate 50 paise per hour
Standard production for one hour 10 units.

18. During a certain week in the month of September, 1987, a worker manufactured 240 articles. Working hours during a week are 48 hours,

standard rate Rs. 5 per hour and standard time to manufacture an article is 15 minutes. Calculate his gross wages for the week according to :

 (*a*) Piece work with guaranteed weekly wages ;

 (*b*) Rowan Premium Bonus Plan :

 (*c*) Halsey Premium Bonus Plan.   (*C. U., B. Com. Hons. '88*)

19. From the following particulars work out the earnings for the week of a worker under :

 (a) Straight Piece Rate ;

 (b) Differential Piece Rate ;

 (c) Halsey Premium System ,

 (d) Rowan Premium System.

Number of working hours per week—48 ; wages per hour—Rs. 3·75.

Normal time per piece—20 minutes : Normal output per week—120 pieces.

Actual output for the week—150 pieces ; Differential piece rate—80% of piece rate when output is below standard and 120% of piece rate when output is at or above standard.

20. (a) A company operates the Rowan premium bonus scheme for its productive workers. During the week ended on 5th November, 1983, employee *A*, whose basic hourly rate of pay is Re. 0·40, was assigned the following jobs which he completed :

Job No.	Time allowed (hr.)	Time taken (hr.)
259	24	18
846	40	25

You are required to calculate :

 (i) *A*'s remuneration for the week in question ; and

 (ii) his effective hourly rate of pay for that week

 (b) What would have been *A*'s remuneration for the week if the Halsey 50 – 50 premium bonus scheme had been in operation ?

21. A workman is paid at the rate of Rs. 2 per hour under Halsey premium plan. He also gets dearness allowance of Rs. 40 per week plus a house-rent allowance @ 12½% of pay excluding incentive bonus but including dearness allowance. From the following details, calculate the workman's earning for the week :

Job No.	Time allowed	Time taken
106	36 hours	24 hours
192	33 hours	22 hours
Waiting time		2 hours

(*C. U., B. Com. Pass '87*)

22. Allowed time for a job was fixed at one hour applying the principles of Time and Motion study ; but the job was completed in 40 minutes. Calculate wages under three methods of payment by results and

show the cost per article under each of the methods, assuming basic time rate of 50 paise per hour.

23. A worker under the Halsey method of remuneration has a basic rate of Rs. 24 per week of 48 hours, plus a cost of living bonus of 10 paise per hour worked. He is given to perform an 8-hour task which he finishes in 6 hours. He is allowed 30% of time saved as premium bonus. What would be his total hourly rate of earnings, and what difference would it make if he was paid under the Rowan method ?

24. From the following data, calculate the earnings per hour under (i) Halsey and (ii) Rowan schemes :

Time allowed for job	5 hours
Time taken	4 hours
Rate per hour	Rs. 8

Compare the earnings per hour when the time taken is (i) 3 hours and (ii) 2 hours.

25. A worker takes 9 hours to complete a job on daily wages and 6 hours on a scheme of payment by results. His day rate is 75 paise per hour. The material cost of the product is Rs. 4 and the overheads are recovered at 150% of total direct wages.

Calculate the works cost of the product under :
(i) Piece Works Plan, (ii) Rowan Plan and (iii) Halsey Plan.

26. From the data given below, calculate the comparative works cost for a job in Factory *A* and Factory *B* :

	Factory A	*Factory B*
Method of paymen. of wages	Halsey Plan (50%)	Rowan Plan
Standard time for the job	250 hours	240 hours
Actual time taken by a worker to complete the job	200 hours	210 hours
Hourly rate of wages	Rs. 2·50	Rs. 3·00
Material cost for the job	Rs. 1,000	Rs. 900
Factory overhead	15% of wages	133⅓% of wages

(*C. U., B. Com. Hons.* '86)

27. In an engineering factory the standard time for manufacturing a Punch base Part No. 52368 is fixed at 6 hours and the rate is Re. 1·00 per hour. An operator completes the work order issued for manufacturing 50 Punch bases within 160 hours. Calculate his total wages and the effective rate of earning per hour under :
(a) Halsey Method (Fifty-fifty),
(b) Rowan Method of remunerating labour.

Also calculate the factory cost of the work order, if material cost is Rs. 36 for a Punch base and the factory overheads are 200% of direct wages.

28. The daily rate of wages in two similar factories for the same type of work is Rs. 6 per day of 8 hours. In factory *A* wages are paid on piece rate and in factory *B* a premium plan based on Halsey system is used.

Compare the hourly rate of earnings of the operators and also the factory cost of a job of the two factories from the following data :

Standard time	10 hours
Piece rate for factory *A*	Rs. 9
Actual time taken to complete a job in both the factories	6 hours
Cost of materials for a job	Rs. 5
Rate of recovery of factory overhead	Re. 0·40 per labour hour

29. Workmen of a particular grade working on 8 hour shift duty are guaranteed a wage of Rs. 32. An incentive scheme is in operation according to which production bonus is earned directly proportional to performance, but only after 100% performance is reached. Four workmen *A, B, C* and *D* produce 48, 60, 75 and 90 units respectively in 6 hours spent in working in a job which has a standard time of 6 minutes per unit as measured work content. Remaining 2 hours of the shift are spent in doing unmeasured work for which no incentive bonus can be paid.

Find for each workman (a) the production performance level achieved and (b) total earnings for the day.

30. A workman whose basic rate of pay is Re. 0·50 per hour is working under the Rowan system of premium bonus. During a week he completes the following jobs : (a) job *A*, for which 30 hours time is allowed, in 20 hours ; (b) job *B*, for which 36 hours time is allowed, in 20 hours. During the week his waiting time amounts to 4 hours. Calculate his earnings.

31. In an engineering works the standard time for a job is 16 hours and the basic wages is Re. 0·80 per hour. A bonus scheme is instituted so that the worker is to receive his normal rate for hours actually worked and for half the hours saved. Materials for the job cost Rs. 8·00 and the factory overhead is charged on the basis of Rs. 1·20 per labour hour.

(a) Calculate the wages and the effective rate of earnings if the job is completed :

      (i)   in 12 hours ;

      (ii) in 14 hours.

(b) Calculate the total factory cost of the job on the same basis.

32. Set out a comparative statement showing the effect of paying wages on (i) the Halsey and (ii) Rowan premium plans, assuming :

Standard time	= 10 hours
Wages rate per hour	= Rs. 4·50
Time taken	= 7 hours
Overhead	= 100% of standard time

33. (a) Based on the data shown below, you are required to calculate the remuneration of each employee, as determined by each of the following methods :

   (i)   hourly rate ;

   (ii) basic piece rate ;

   (iii) individual bonus scheme, where the employee receives a bonus in proportion of the time saved to the time allowed :

Data

Name of employee	Saxena	Sarma	Saggi
Units produced	270	200	220
Time allowed in minutes per unit	10	15	12
Time taken in hours	40	38	36
	Rs.	Rs.	Rs.
Rate per hour	1·25	1·05	1·20
Rate per unit	0·20	0·25	0·24

(b) Comment briefly on the effectiveness of method (iii) above.

34. Using the information given below you are required to :

(a) Calculate the amounts earned by each employee under each of the following remuneration methods :

   (i)   piece work (with guaranteed hourly rates) :

   (ii) hourly rates :

   (iii) bonus system (under which the employee receives $66\frac{2}{3}\%$ of time savings).

(b) Calculate the gross wages paid to each employee under each of the above methods :

	Employee :	Employee B	Employee C
Time allowed : hours per 100 units	24	32	38
Price per unit	6·25p	5p	7·5p
Guaranteed hourly rate	30p	37·5p	25p
Actual time taken : hours	40	42	39
Actual units produced	200	125	150

35. In a scheme of payment by results, employees are paid a bonus on hours saved at the basic wage rates. The bonus hours gained are calculated on the hours saved multiplied by the ratio of time saved to time allowed. Jobs are carried forward from one week to another and no overtime is required. Payment is made in full for total units produced. Details are as follows :

Employee	X	Y	Z
Unit issued to worker (dozen)	40	65	35
Time allowed (hours)	108	125	75
Basic wage rates per hour	Rs. 1·40	Re. 1·00	Rs. 1·60
Time taken (hours)	72	75	80
Rejects (units)	32	68	20

You are required to calculate for each employee :

(a) bonus hours and bonus earned :

(b) gross wages earned :

(c) wage cost per good unit produced.

36. The rate of pay of *X*, a workman, is Rs. 3 per hour. He is working under the Rowan system. In addition, he receives a cost-of-living bonus of Rs. 36 per week of 45 hours.

During a particular week he does the following jobs :

Job *A*, for which 24 hours are allowed, in 18 hours.

Job *B*, for which 32 hours are allowed, in 20 hours.

During the week his waiting time amounts to 7 hours.

Calculate the worker's earnings and the amount to be charged to each job and overhead account.

37. In a factory two workmen *A* and *B* produce the same product using the same material. Their normal wage rate is also the same. They are paid according to the Rowan system. The time allowed for the work is 40 hours. *A* takes 25 hours and *B* takes 30 hours to finish the product. The factory cost of the product for *A* is Rs. 193·75 and for *B* Rs. 205. The factory overhead rate is Re. 1 per man-hour. Find the normal rate of wages and the cost of materials used for the product.

38. The standard time for a job is 60 hours. The hourly rate of guaranteed wages is Re. 0·75. Because of saving in time, a worker gets an hourly wage of Re. 0·90 under Rowan Premium Bonus system. For the same saving in time, calculate the hourly rate of wages a worker *B* will get under Halsey-Weir Premium Plan assuming 40% to worker.

39. From the following particulars calculate the group bonus payable and the amounts that will be paid to each member of the group :

Standard production in a week—120 units.

It is agreed that for every 10% increase in production, bonus of 5% of the total wages payable for the week will be paid and the same will be shared by the members of the group consisting of 4 members in proportion to their total wages of the week.

Total production for the week—145 units.

Wages earned by the 4 members of the group (*P*, *Q*, *R* and *S*) are respectively Rs. 80, Rs. 78, Rs. 72 and Rs. 68.

40. In a coach building factory a group of ten workers work on a group incentive scheme and wage rate of each worker is the same, which is Rs. 2·50 per hour. The standard output for a month of 25 days, each day being of 8 hours, is 25 new bus bodies.

A bonus of Rs. 200 is paid to the group for efficiency above 100%. Between 80% and 99% of efficiency, bonus of Rs. 150 is paid, and below 80% efficiency hourly rate is guaranteed.

During the month of March, April and May, 1982 the actual output had been as under :

	No. of bus bodies
March	15
April	22
May	31

Bonus to the group is shared equally by the workers in the group.

You are required to calculate total earnings per worker for March, April and May, 1982 and also the effective rate of earning per worker per hour.

Assume that all the workers in the group were present for all the working days as given under :

March—25 days, April—24 days, May—26 days.

41. In a unit, 10 workers work in a group. If the production of the group exceeds 5 units per minute, a bonus of 80% of the time saved is paid to the group.

Following is the production of a particular week :

	Hours worked	*Production*
		(units)
Monday	90	39,000
Tuesday	80	36,000
Wednesday	80	31,000
Thursday	85	33,000
Friday	75	26,000
Saturday	70	21,000
	480	1,86,000

Calculate bonus earnings and total earnings of two workers *A* and *B* of the group.

A worked 48 hours and his basic rate is Re. 0·60 per hour.

B worked 42 hours and his basic rate is Re. 0·50 per hour.

42. B. K. Engineering Company Limited operates a group incentive scheme in one of its departments. A minimum hourly rate is guaranteed to each of the six employees in the group, if actual output for the week is less than standard output. If actual output is greater than standard output, the hourly rate of each employee is increased by 4% for each additional 300 units of output produced. The standard output for the group is 6,000 units for a 40-hour week.

During the week ended 4th May, 1980 each employee in the group worked 40 hours, actual output and minimum hourly rates were as follows :

Employee	Actual output in units	Minimum hourly rate Rs.
P. Agarwal	1.250	1·40
R. Bahadur	1,350	·50
G. Chanda	1,200	·20
J. Das	1 250	1·40
K. Gaggar	1,230	·20
R. Jagtiani	1,220	·30

You are required to calculate the earnings of each employee.

43. Ten men are working as a group on a particular manufacturing project. When the weekly production of the group exceeds a standard number of pieces per man-hour, each man in the group is paid a bonus for the excess production in addition to his wages at hourly rate. The amount of bonus is computed by first determining the percentage by which the group's production exceeds the standard. One-half of this percentage is then applied to a wage rate of Rs. 8 to determine an hourly bonus rate, irrespective of the variation in individual hourly wage rates. Each man in the group is paid, as a bonus, this bonus rate applied to his total hours worked during the week. The standard rate of production before a bonus can be earned is 200 pieces per man-hour :

On the basis of the production record stated below, compute :

(i) the rate and amount of bonus for the week,

(ii) the total wages of *A* who worked 40 hours at a base-rate of Rs. 6 per hour and of *B* who worked 39½ hours at a base-rate of Rs. 9 per hour.

	Man-hour worked	Production
Monday	72	17,680
Tuesday	72	17,348
Wednesday	72	18,000
Thursday	72	18,560
Friday	71·5	17,888
Saturday	40	9,600
	399·5	99,076

(iii) How much is the labour bonus cost to be attached to each unit of the week's production ?

44. Ten men work as a group. When the weekly production of the group exceeds standard (200 pieces per hour) each man in the group is paid a bonus for the excess production in addition to his wages at hourly rates. The bonus is computed thus :

The percentage of production in excess of the standard amount is found and one-half of this percentage is considered as the men's share. Each man in the group is paid, as a bonus, this percentage of a wage rate of Rs. 3·20 per hour. There is no relationship between the individual

worker's hourly rate and the bonus rate. The following is one week's record :

	Hours worked	Production
Monday	90	22,100
Tuesday	88	22,600
Wednesday	90	24,200
Thursday	84	20,100
Friday	88	20,400
Saturday	40	10,200
	480	1,19,600

Calculate :

(a) the rate and amount of bonus for the week.

(b) total earnings of Gorapada Garai who worked $41\frac{1}{2}$ hours during the week and was paid Rs. 2 per hour as basic rate.

(c) total earnings of Haripada Halui who worked $44\frac{1}{2}$ hours and was paid Rs. 2·50 per hour as basic rate.

45. A company manufactures three products X, Y and Z. It has forty direct employees who are paid under a group bonus scheme. There are three grades of employees who are paid a bonus of the excess of time allowed over time taken. The bonus is paid on the employee's base rate less Re. 0·50, and is shared by the direct workers in proportion to the time spent on the work. The production details for the period in question were as follows :

	Products		
	X	Y	Z
Units produced	60	120	400
Time allowed per unit (minutes)	58	140	150
	Grade of Employee		
	A	B	C
No. of direct employees	20	8	12
Base rate (Rs.)	1·50	2·00	1·80
Hours worked per employee	20	24	30

From the above information you are required to calculate (a) the percentage of hours saved to hours taken, (b) the total bonus payable to the group of direct employees, and (c) the total wages payable to the group of direct employees. (Any calculation which does not work out exactly is to be taken as correct to one decimal place, or in the case of money as correct to the nearest paise.)

46. The normal working week in a factory comprises 44 hours. A worker is paid Re. 0·50 per hour, overtime at $1\frac{1}{2}$ times the hourly rate and a bonus of Re. 0·25 for every 100 articles produced in excess of 5,000 per week. Calculate his wages from the following particulars taken from his time and job card :

Days	In	Out	In	Out	Output
Friday	8-00	12-00	1-00	5-30	950
Saturday	8-00	11-30	—	—	545
Monday	8-30	12-00	1-00	8-00	1,106
Tuesday	8-00	12-00	1-00	6-00	1,052
Wednesday	8-00	12-00	1-00	6-30	1,002
Thursday	8-00	12-00	1-00	7-00	1,112

47. A worker is paid under the Rowan Premium Bonus scheme. The following data are given :

(i) Guaranteed time rate   60 paise per hour

(ii) The jobs done and time taken by him during the week of 8 hours a day, were distributed as under :

Job *A*	20 hours
Job *B*	12 hours
Job *C*	16 hours

(iii) Standard time allowed for the jobs are :

Job *A*	24 hours
Job *B*	16 hours
Job *C*	18 hours

(iv) Overtime work in excess of 44 hours per week is paid for at double the ordinary time rate.

Determine the wages earned by the worker during the week and the labour cost of the jobs *A*, *B* and *C*.

48. *A* worked 10 hours for job 20 and 15 hours for job 30 including 5 hours overtime in job 30. *B* worked 15 hours in job 20 and 25 hours in job 30. He was also paid for 5 hours of idle time due to machine break-down. Hourly wage rates of *A* and *B* are 50 p. and 60 p. respectively.

Calculate total wages and show how the total amount shall be treated in cost accounts.

Overtime is paid at double the usual rate. Overtime had to be paid for urgency of job 30.

49. Three workers have completed job No. 30. The details are as below :

Workers	Rate per hour	Net time worked	Time required for setting machines	Idle ti.
	Rs.	Hrs.	Hrs.	Hrs.
A	2·00	10	1	4
B	1·50	12	¼	—
C	1·00	6	2	2

Idle time was caused by failure of electricity and breakdown of machine in the first and second case respectively.

Calculate total wages and show how **the** total amount shall be treated in cost accounts.

50. A factory issues a job to employee *P* to produce 35 articles with a time allowance of 2 standard hours each, and another job to employee *Q* for 60 articles with a standard time allowance of 1½ hours each. For every hour saved, a bonus is paid at 50 per cent of the base rate, which is Rs. 2·00 per hour. The factory works a 40-hour week and overtime is paid at time plus a third. At the end of the week *P*'s clock card shows 49 hours and *Q*'s 46 hours and the work is complete : three of *P*'s articles failed to pass inspection, however, and the same applied to four of *Q*'s. This was due to defective materials and in view of this, all the units produced were paid for, although as scrap they have no sales value.

Calculate for *P* and *Q* : (a) the bonus payable, (b) the total gross wages payable, and (c) the wages cost per unit of goods passing inspection.

51. The following particulars for the first week of September, 1985 relate to *A* and *B*, two workers, employed in a factory :

		A	B
(1)	Job completed (units)	3,600	4,200
(2)	Out of above, output rejected which also became unsaleable	540	450
(3)	Time allowed	2 minutes per dozen	3 hours per 200 units
(4)	Basic wage rate per hour	Rs. 5	Rs. 6
(5)	Hours worked	45	50

The normal working hours per week are fixed at 42 hours. Bonus is paid @ ⅔ of the basic wage rate of gross time worked and gross output produced without deduction for the rejected output. The rate of overtime for the first 4 hours is paid at time plus ¼ and for the next 4 hours is paid at time plus ½.

From the above data calculate for each employee :

(a) Number of bonus hours earned and the amount of bonus earned.

(b) Total wages earned including basic wages, overtime premium and bonus.

(c) Direct wages cost per 100 saleable units.

(I. C. W. A. Inter., Adapted)

SECTION I

INTRODUCTION

Any expenditure which cannot be charged directly to any job, operation or process may be called overhead. Thus, overhead indicates indirect expenditure of any kind. It includes *indirect materials, indirect wages* and *indirect expenses.*

Overhead defined

Eric L. Kohler defined overhead as "any cost of doing business other than a *direct cost* of an output of product or service". He also points out that overhead is "a generic name for manufacturing costs of materials and services *not readily identifiable with the products or services* that constitute the main output of an operation. Overhead, therefore, means those expenses which cannot be allocated to any product or service (as direct cost) but can be apportioned to, or absorbed by, the products or services.

Many authors defined overhead in different language, but each definition carries the same sense. According to *H. J. Wheldon*, overhead may be defined as the cost of indirect material, indirect labour and such other expenses including services as cannot conveniently be charged to a specific unit. *W. W. Bigg* says that all indirect costs are termed as overheads. According to *W. M. Harper*, overheads are costs which do not result solely from the existence of individual cost units.

[*Note : Indirect materials* refer to material cost which cannot be allocated to any job or process, but can be apportioned to or absorbed by jobs or process. *Indirect wages* refer to wages other than direct wages. *Indirect expenses* are also expenses other than direct expenses. Aggregate of these three constitutes overhead.]

What is a direct cost and what is an item of overhead are matters of judgment *in many cases.* For example, from the electric meter of a department, the cost of electricity consumed by the department during a given period can be known ; but in order to know the cost of electricity consumed by each cost centre or cost unit of the department, detailed technical arrangements are required. In the above stated circumstances, the management of one factory may make the arrangement at some cost, while the management of another factory may consider it undesirable because of the amount of cost involved. Thus, cost of electricity in the former factory can be treated as direct cost, while that in the latter factory has to be treated as indirect cost, i.e., overhead. It can be generally said *that some item of cost may be treated as direct cost in one organisation and as*

indirect cost in another organisation depending upon the decision on the basis of economic and other considerations.

What is tried to express in the above few lines is that, in many cases, it is not possible to clearly distinguish between direct cost and indirect cost.

Where the process of making direct measurement of an expense in relation to a cost centre or cost unit is considered wasteful or where there is no acceptable method of such direct measurement, the expense is treated as overhead.

Different names of overhead

Overhead has many other names such as overhead cost, overhead expense, overhead charges, manufacturing and commercial expense, indirect cost, non-productive cost, supplementary expense, supplementary cost, burden, on cost, load, loading etc.

Sometimes distinctions are drawn between these terms, but such distinctions are not consistently observed. *In fact*, all these terms are used to mean the same thing i.e., overhead.

Importance of overhead

The present-day importance of overhead cost reflects the employment of expensive equipment and elaborate organisations in which many employees do not work directly on the product itself. Where handicraft methods of production prevail, the costs which can be traced directly to the product may be *only material and labour.*

At one time overhead costs were viewed as the result of 'non-productive' factors, particularly when they arose from the presence of personnel not working on the product itself (as for example, supervisors, engineers, clerks, accountants, maintenance men etc.). However, by employment of staff specialists, it has been possible for the management to use the improved methods and information devised by the staff specialists, to direct operations more economically. As a result, now, the cost of product has been reduced. Similarly, cost is reduced when more specialised machinery and less labour are employed, *although the proportion of overhead cost may, at the same time, be increased.*

In India, during the past few decades, big manufacturing units have been established with automatic and semi-automatic plants for the purpose of mass production. Overheads, in these industries, are considerable and as a result the cost of production in these types of industries in both Public Sector and Private Sector, has been increasing. This is undesirable, particularly where the industry produces basic materials or materials essential for agriculture or products of household use. Thus, overhead expenditure which unduly inflate the cost of production must be brought within proper control through well devised cost accounting system and cost control system.

Classification of Overhead

"Any classification of overhead costs begins with the determination of responsibilities for cost incurrence. For this purpose, responsibility constitutes an organisational unit, such as a department, having a single head accountable for costs incurred by the activities of the unit." The classification of overhead by responsibilities or departments fixes resposibility for control, and at the same time, facilitates apportionment of such cost to products. *This classification is, therefore, classification by responsibilities* or *departments.*

Costs incurred by each responsibility are classified by nature of expenditure or object for which the expenditure was incurred. This sub-classification indicates the costs for which the departmental head is held responsible. The classification by nature of expenditure is usually uniform throughout the organisation so that expenditure of a particular nature incurred in all the departments may be combined, if so desired, to facilitate cost interpretation on departmental statements (for exmple, costs of internal transport in all the departments may be combined to know the total cost of internal transport of the organisation). *This classification may be called either the classification by nature of expenditure or elementwise classification.* Still, there may be another aspect of classification by nature of expenditure. The nature of expenditure may be fixed or variable or semi-variable (or semi-fixed). So, classification by nature of *expenditure also includes classification according to the nature of variability of the expenditure.*

Similarly, classification according to controllability of the expenditure is also classification by nature of expenditure.

The above stated classifications may be presented in the following manner :
(a) *Functionwise classification*
(b) *Elementwise classification*
(c) *Behaviourwise classification*
(d) *Controlwise classification.*

Let us discuss each of the above briefly.

(a) *Functionwise classification.*

Every manufacturing organisation has three distinct functions namely :
  (i) Production function :
 (ii) Administrative function ; and
(iii) Selling and Distribution function.

All indirect expenses incurred in connection with production function are *production overhead or factory overhead* or *works overhead.*

Stores expenses, time office expenses, pay-roll department expenses, internal transport cost, supervision cost, factory clerical cost, indirect labour, personnel department expenses, factory supplies, maintenance and repair, insurance, depreciation, canteen expenses, rent, rates and taxes etc. are examples of production overhead.

All expenses incurred in connection with the general administration of the organisation are *administration or office overhead.* These expenses relate to formulation of policies, control of activities not directly connected with production, sales or distribution.

Rent, rates and taxes of administrative building : salary of the staff office connected with general administration ; depreciation of office equipment and of building ; postage, telegram and telephone : stationery ; office expenses ; directors' remuneration : bank charges etc. are examples of administration overhead.

All expenses incurred in connection with sales function are *selling overhead* and those connected with distribution function (i.e., delivery of products sold) are *distribution overhead.* These two are normally treated alike.

Salesmen's salary and commission : window dressing expenses : advertisement expenses including free gifts : samples : exhibition etc., travellers' commission ; market research expenses ; cost of after-sales services ; normal bad debt etc. are examples of *selling overhead.* Godown expenses in connection with storing of finished products awaiting sale : packing charges ; loading and unloading : freight (where it is not charged to customers) ; insurance : maintenance and repair of delivery vans : salary of deliverymen etc. are examples of *distribution overhead.*

Selling and distribution overhead are often called '*After Production Costs.*'

If production, administration and selling and distribution are distinct departments of which responsibility lies with the departmental heads, the functionwise classification resembles with classification by responsibility or department.

(b) *Elementwise classificat.on*

If indirect expenses are classified elementwise we come across three classes :

(i) Indirect material :

(ii) Indirect labour ; and

(iii) Indirect expenses.

Elementwise classification may be done within each function or for all functions taken together.

Factory overhead expenses may be classified into indirect material, indirect labour and indirect expenses. Similarly, administration overhead expenses and also selling and distribution overhead expenses may be classified into indirect materials, indirect labour and indirect expenses : but the striking feature is that, while classifying factory overhead expenses into indirect material, indirect labour and indirect expenses, we require carefulness, because in factory overhead only there are direct material, direct labour and direct expenses to be carefully set aside. In administration as well as in selling and distribution overhead all materials, all labour and all expenses are indirect.

The following are some examples :

Indirect materials

> *Factory*—Consumable stores, jute and cotton wastes, lubricating oil, first aid materials, fire-extinguishing materials, stationery, canteen food stuff etc.
>
> *Administration*—Stationery, canteen food stuff, cleaning materials etc.
>
> *Selling and distribution*—Packing materials, stationery, fuel and lubricating oil for delivery vans etc.

Indirect labour

> *Factory*—Salary of foremen, supervisors, works manager etc. ; wages of maintenance and repairs staff ; wages of indirect workers ; wages of time office and pay-roll department personnel ; wages of stores staff etc.
>
> *Administration*—Salary of all employees of administrative function from managing director down to sweeper ; directors' remuneration etc.
>
> *Selling and distribution*—Salary of sales office staff and distribution men.

Indirect expenses

> *Factory*—Repairs and maintenance, rent, rates and taxes, insurance, depreciation, stores expenses (other than salaries of repairs staff, maintennace staff and stores staff) etc.
>
> *Administration*—All expenses in connection with general administraion (other than salary and materials used) such as, rent, rates and taxes, lighting, depreciation, printing, postage etc.
>
> *Selling and distribution*—Godown rent, insurance, advertisement, depreciation, window dressing, exhibition, market research etc.

(c) *Behaviourwise classification*

How each element of overhead behaves, when there is a change in the volume of production, is the main consideration for behaviourwise classification.

Expenses that remain fixed irrespective of the level of output constitute *fixed overhead* ; expenses that change proportionately with the change in the level of output constitute *variable overhead* and expenses that change *but not proportionately* with the change in the level of output constitute *semi-variable overhead* or *semi-fixed overhead*.

This classification is of fundamental importance for the purpose of marginal costing, for preparing flexible budget or standards and also for the purpose of control of overhead costs.

The following are some of the examples of fixed, variable and semi-variable (or semi-fixed) overhead costs :

> *Fixed overhead*—Rent, rates, insurance, postage, stationery, salary of management staff etc.
>
> *Variable*—Indirect labour, indirect material, power, packing, travellers' and salesmen's commission etc.

Semi-variable or *semi-fixed*—Repairs and maintenance, depreciation, supervisor's salary etc. Upto a certain level of production these items remain fixed ; but beyond that level they increase, but not in strict proportion. Thus, in the semi-variable overhead there are fixed elements and variable elements. These are to be segregated to have only two classes—fixed overhead and variable overhead.

Different methods, like *level of activity method, analytical method,* simultaneous equation method, high and low method etc. can be used for segregation of semi-variable overheads into fixed overhead and variable overhead.

Let the semi-variable overhead costs corresponding to the output are as below :

Semi-variable overhead costs	*Output*
Rs.	units
8,000	3,000
9,000	3,500

By simultaneous equation method, the variable and fixed elements present in semi-variable overhead can be found as below :

Let x fixed overhead cost and y be the variable overhead cost per unit. Now,

$$\text{Rs. } (x+3,000y) = \text{Rs. } 8,000 \qquad \ldots \quad (1)$$
$$\text{Rs. } (x+3,500y) = \text{Rs. } 9,000 \qquad \ldots \quad (2)$$

deducting (1) from (2), $500y = \text{Rs. } 1,000$
$$\therefore \quad y = \text{Rs. } 2$$

Substituting the value of y in equation (1) we get,
$$\text{Rs. } (x+6,000) = \text{Rs. } 8,000$$
$$\therefore \quad x = 2,000.$$

Thus, the fixed element amounts to Rs. 2,000 and the variable element Rs. 2 per unit.

(d) *Controlwise classification*

Overhead costs which can be controlled by the exercise of proper managerial influence are *controllable costs* and overhead costs that cannot be controlled in spite of the best exercise of managerial influence are *uncontrollable costs.*

[*Note :* When the *nature* of any expenditure is to be explained, the *nature* may be stated :

   (i) On one consideration, as indirect material, indirect labour or other indirect expense.

   (ii) On another consideration, as fixed, variable or semi-variable (or semi-fixed).

   (ili) On still another consideration, as controllable or uncontrollable.

     Thus, elementwise classification, behaviourwise classification and controlwise classification resemble classification by nature of expenditure.]

Grouping of expenses

For the sake of effective analysis and control of expenditure under any classification, further classification of expenses into smaller sub-divisions

is required so that expenses of the same nature are grouped under one head. Thus, suitable *heads of expenses* should be introduced. Cost Accountants use *Standing Order Numbers* for grouping factory overhead expenses and *Cost Account Numbers* for grouping administration, selling and distribution expenses.

In most cases, for convenience, expense heads are allotted *Code numbers* either in *Mnemonic method* or in *Decimal method* usually, although there are various other methods also. Under Mnemonic Method heads of expenses are marked by abbreviations, for example *DEP* for depreciation, *MA* for maintenance, *AD* for administration, *REN* for rent and so on.

Under Decimal Method each head of expense is allotted a number, for example, 2 for stores, 2·01 for stores salary, 2·02 for rent of stores, 2·03 for lighting of store and so on.

How the expense heads shall be allotted code numbers depends upon the needs of costing system introduced by an individual factory.

<div align="center">SECTION II</div>

PRODUCTION OR FACTORY OVERHEAD

We know that prime cost *plus* factory overhead represents factory cost or works cost. The elements of prime cost, i.e., direct material, direct labour and chargeable expenses are directly related to cost units or cost centres, but the elements of factory overhead cannot be specifically related to cost centres or cost units. These expenses are to be apportioned to various departments as all these departments derived benefits from the same expense. After apportionment to various departments they are apportioned to cost centres or production units. The procedure involves the following steps.

(a) Classification of overheads to find out the items of factory overhead.

(b) Collection of factory overhead.

(c) Distribution of each item of factory overhead to production and service departments on suitable basis.

(d) Redistribution of service departments' cost to production departments so that all the production departments together consume the entire factory overhead.

(e) Absorption of factory overhead coming to the share of each production department by the production units produced in that department.

So far as classification of overheads (as mentioned in 'a' above) is concerned, it has already been discussed in the earlier section of this chapter. Let us discuss the other items one by one.

Collection of factory overhead

Collection of factory overhead expenses should be done under standing order numbers, a number being provided for each item of expense. The documents from which these are to be collected are :

(i) Stores requisition

From stores requisition we can know the amount of indirect materials drawn. The stores requisition will show the standing order number and the department drawing such indirect materials. The total value of the indirect materials drawn is *debited to Factory Overhead A/c and credited to Stores Ledger A/c.*

(ii) Time or job card and wages analysis

Indirect wages payable by each department are obtained from the time or job cards. These are booked against standing order numbers. From the time or job cards the wages analysis is periodically prepared. Thus, the wages analysis shows the total indirect wages of the factory for a particular period. *This total amount is debited to Factory Overhead A/c and credited to Wages Control A/c.*

(iii) Purchase documents

Indirect materials may be purchased and consumed without passing them through Stores Ledger and services may be received from outside agencies. Invoices are received for these materials or services. These invoices are entered in Purchases Journal maintained for the cost collection. The items obtained from Purchases Journal are further analysed according to standing order numbers. At the end of a period the total of the Purchases Journal is *debited to Factory Overhead A/c and credited to Cost Ledger Control A/c.*

(iv) Cash Book and Petty Cash Book

From the Cash Book and Petty Cash Book indirect expenses relating to production must be collected for each department under standing order numbers.

(v) Subsidiary documents

There are certain costs which do not mean cash outlay, for example, depreciation, notional rent, notional interest etc. These items are to be collected by scrutinizing the subsidiary documents. For example, depreciation can be obtained from plant ledger, notional rent and notional interest etc. can be obtained from the documents wherein estimates of such costs are recorded.

It must be remembered that there are some items of expenses which may not be solely attributable to factory overhead. They may be attributable to factory overhead, administration overhead, selling overhead and distribution overhead. So, such expenses must be apportioned amongst factory, administration, selling and distribution overheads.

Distribution of Factory Overhead to production and service departments

Every manufacturing concern divides its factory into various departments for the purpose of better control, better costing of jobs and products etc. Each department is a cost centre. These departments are of two

types—(1) *Production departments* and (2) *Service departments.* Production departments actually produce the output or carry on the process or operation, while the service departments render services to the production departments. Service departments are auxiliary departments. They do not produce, but their existence is essential for the production departments. because without the help of the service departments in terms of special types of services they render, the production departments cannot produce.

Expenses are incurred in both production departments and service departments. Some expenses are incurred for the benefit of all the departments. Thus, an expense which has been incurred for the benefit of any one department exclusively, can be charged to that department only ; but an expense which has been incurred for the benefit of all the departments has to be distributed to all the departments on some suitable basis. This process of distribution is called *Primary Distribution.* Primary distribution represents assigning, allocating or apportioning the overhead expenses to all the departments of the factory to which they apply.

We have mentioned above two terms namely *allocation* and *apportionment.* Let us explain the meaning of the terms and how they differ from each other, before looking into the various bases used for primary distribution of expenses.

Allocation of expenses

According to ICMA, London, allocation of expenses means "the allotment of whole items of cost to cost centres or cost units." Allocation, therefore, means charging to a department or cost centre that expense which has been incurred for that department or cost centre. In other words, overhead expense identifiable to a department is charged to that department only and this is called *allocation.* When any expense is allocated to a department the question of sharing that expense by other departments does not arise. For example, where separate electric meters are provided, the cost of electricity shown by electric bills for any department is allocated to that department only.

Apportionment of expenses

According to ICMA, London, apportionment of expenses means "the allotment to two or more departments or cost centres of proportions of common items of cost on estimated basis of benefit received." Apportionment is, therefore, charging to a cost centre or a department a fair share of an overhead expense.

Let us take the same example of electricity cost. If the departments are not provided with separate meters, there will be only one electricity bill, the amount of which must be shared by all the department on some reasonable basis. Charging of the reasonable share of the bill to a cost centre or department is known as *apportionment.*

Allocation and Apportionment distinguished

1. Allocation deals with items which are identifiable with any one department. For example, indirect wages of departments *A*, *B* and *C* are separately obtained and hence the whole indirect wage of the respective department is charged to that department only. Allocation, therefore, deals with whole items while apportionment deals with only a particular portion of items of cost.

2. Allocation indicates direct process of charging, because allocable cost need not be shared by more than one cost centre. Apportionment, on the other hand, needs the ascertainment of reasonable share of expense to be borne by the various departments benefited. After ascertaining the share of such expense to be borne by a particular department, amount can be charged apportioned to that department.

3. Allocation is a much wider term than apportionment.

4. Whether on expense is to be allocated or apportioned does not depend upon the characteristic of the expense, but it depends upon the relationship between the expense and the cost centre or cost unit.

It must be remembered that—(i) overheads cannot generally be allocated to products, because they are not identifiable easily with the products. Overheads can be apportioned to or absorbed by the products on some suitable basis ; (ii) Certain overhead expenses (for example, indirect wage of departments) are identifiable with a particular department and may be allocated to that department, but not to the products of the department. Such expenses relating to a department can be apportioned to the products of the department on some suitable basis.

Bases of primary distribution commonly used

(a) *Area occupied (i.e., floor space occupied)* : On this basis expenses relating to accommodation such as rent, rates and taxes, insurance of building, depreciation of building etc. are primarily distributed. In the absence of other more specific basis, lighting expense is also distributed on this basis. Night watching expense is also distributed, often, on this basis.

(b) *Capital values of respective assets* : Repairs and insurance of plant and machinery, depreciation of plant and machinery etc. are distributed on the basis of capital values of plant and machinery. Insurance of stock is distributed on the basis of stock value and so on.

(c) *Kilowatt hours Horse power of machines* : On this basis, power cost is distributed. When the hours of work in different departments vary widely the basis should be Horse power × Machine hours instead of Horse power only.

(d) *Light points and wattage* : Lighting expense, i.e., electricity is distributed on the basis of number of light points. This becomes appropriate if there is uniformity in the wattage of the points. If the wattage vary the

basis of distribution should be wattage and not the number of light points. Again, if the hours of work in the departments vary, wattage × hours of work should be the basis of distribution.

(e) *Number of employees* : On this basis, canteen expenses, time-keeping, personnel deptt. expenses, first aid etc. are distributed. In fact, all welfare expenses depending upon the number of employees should be distributed on this basis. Employer's liability insurance is also distributed on this basis.

(f) *Departmental wages* : This basis is commonly used in practice to distribute factory overhead expenses, but this is not always satisfactory. Only those items which vary according to direct wages may be suitably distributed on this basis, for example, premia for workmen's compensation insurance. Supervision expense is often distributed on this basis although it does not appear to be very appropriate.

(g) *Production hours of direct workers* : Works management expenses, general overtime expenses and most of the general expenses are suitably distributed on this basis. If the work is done mainly with the help of machines, *machine hours* instead of production hours of direct workers is used as the basis.

(h) *Technical estimates* : Some expenses are distributed amongst the departments on the basis of technical estimates, for example, steam charge.

Illustration 1.

Lindwal Ltd. has five departments of which *A, B* and *C* are production departments while *X* and *Y* are service departments. The following are the particulars relating to the departments :

	A	B	C	X	Y
Floor area occupied (sq. metres)	180	120	100	70	30
No. of employees	20	15	12	8	5
Horse power of machines	600	400	500	--	—
Wages (in Rs.)	50,000	40,000	30,000	15,000	5,000
Value of plants (in Rs.)	2,40,000	2,00,000	1,60,000	1,00,000	50,000
Value of buildings (in Rs.)	5,00,000	3,00,000	2,00,000	1,00,000	50,000
No. of light points	30	20	15	10	5
Value of stock (in Rs.) .	1,50,000	1,00,000	50,000	—	—

Distribute the following costs to the various departments on the most equitable basis :

Rent, rates and taxes Rs. 5,000 ; Repairs to buildings Rs. 11,500 ; Repairs to plants Rs. 7,500 ; Depreciation of plants Rs. 22,500 ; Insurance of stock Rs. 1,500 ; Insurance of plants Rs. 750 ; Power Rs. 4,500 ; Lighting Rs. 800 ; Supervision Rs. 6,000 ; Premia for workmen's compensation insurance Rs. 1,400.

Solution :

Primary Distribution Summary

Items of Cost	Basis of distribution	Total Amount Rs.	Production Deptts.			Service Deptts.	
			A Rs.	B Rs.	C Rs.	X Rs.	Y Rs.
Rent, rates & taxes	Floor area occupied (18 : 12 : 10 : 7 : 3)	5,000	1,800	1,200	1,000	700	300
Repairs to buildings	Value of buildings (10 : 6 : 4 : 2 : 1)	11,500	5,000	3,000	2,000	1.000	500
Repairs to plant	Value of plants (24 : 20 : 16 : 10 : 5)	7,500	2,400	2,000	1,600	1,000	500
Depreciation to plant	—Do—	22,500	7,200	6,000	4,800	3,000	1,500
Insurance of stock	Stock value (15 : 10 : 5)	1,500	750	500	250	—	—
Insurance of plants	Value of plants (24 : 20 : 16 : 10 : 5)	750	240	200	160	100	50
Power	Horse power of machines (6 : 4 : 5)	4,500	1,800	1,200	1,500		—
Lighting	No. of light points (6 : 4 : 3 : 2 : 1)	800	300	200	150	100	50
Supervision	No. of employees (20 : 15 : 12 : 8 : 5)	6,000	2,000	1,500	1,200	800	500
Premia for workmen's compensation insurance	Wages (10 : 8 : 6 : 3 : 1)	1,400	500	400	300	150	50
	Total	61,450	21,990	16 200	12 960	6 850	3,450

Note The total overheads of service departments should also included direct wages. This has been discussed subsequently.

Redistribution of service department costs

The factory overhead expenses are to be ultimately charged to the jobs, production units, processes or operations. The service departments only render services to the production departments where the jobs are being executed, products are being produced, processes are being carried on or operations are being done. So, the service department costs are to be apportioned to the production departments in order to facilitate charging of all factory overheads to jobs, products, processes or operations. This apportionment is called *Secondary distribution.*

[The American authors usually use the terms *primary distribution* (when costs are apportioned to production and service deptts.) and *secondary distribution* (when service department costs are apportioned to production departments.)]

Let us see the usual bases used for secondary distribution.

Costs of the Service Deptts.	*Basis*
1. Maintenance and repair shops	Direct labour hours,
2. Planning & Progress	Machine hours,
3. Tool room	Direct labour wages,
	Asset value × hours worked.

Costs of the Service Deptts.	*Basis*
4. Canteen and welfare	⎱ No. of direct workers ?
5. Hospital and Dispensary	⎰
6. Personnel Department	No. of employees etc.
7. Time-keeping	
8. Computer Section	No. of cards punched, Computer hours, Specific allocation to deptts.
9. Power house (electric light cost)	Floor area, Cubic content, No. of electric points
10. Power house (electric power cost)	Wattage, Horse Power, Kwh, Horse Power × machine hours. Kwh × machine hours
11. Tool Room	Direct labour hours, specific allocation to deptts.
12. Stores department	No. of requisitions, weight or value of materials issued
13. Time & Motion Study	Time spent for studies
14. Transport department	Crane hours, Truck hours, Truck milage, Truck tonnage. Truck ton-hours, Tonnage handled. No. of packages of standard size
15. Fire protection	Capital values
16. Inspection	Inspection hours

Notes : (1) Repairs included in Repairs Shop Cost, building maintenance cost included in Maintenance Shop Cost etc. should be apportioned on the basis of *capital values*.

(2) *Economy, practicability, equitability and reliability* are the matters of consideration for selection of the base.

Let us now examine how the costs of service departments may be apportioned to production departments. The following are the different ways :

(A) **Apportionment of service department costs to production departments straight.**

(B) **Apportionment of service department costs to other service departments and production departments on :**

      (i) *Non-reciprocal basis*

      (ii) *Reciprocal basis*

Let us explain each of the above.

(A) *Apportionment of service department costs to production departments straight.*

Here the services rendered by one service department to other service departments are ignored. It is assumed that each service department renders services to the production departments only and hence its cost is distributed only to the production departments. Let us look into the following illustration.

Illustration 2.

The following are the particulars relating to the production departments —P_1, P_2 and P_3 and the service departments—Canteen, Power house, Store, Time-keeping & Accounts and Repair shop.

	Costs after primary distribution
Production departments	Rs.
P_1	20,000
P_2	18,000
P_3	25,000
	63,000

Service department costs :	Rs.
Canteen	1,500
Power house (lighting)	1,200
Power house (power)	4,000
Stores	3,600
Time-keeping and Accounts	3,000
Repair shop	4,500
	17,800

Other information available :

	P_1	P_2	P_3
No. of employees	30	25	20
No. of light points	6	8	10
Horse power of machines	300	200	300
No. of requisitions	4,000	3,000	5,000
Value of Assets (Rs.)	1,00,000	1,50,000	2,00,000

Show the secondary distribution on direct redistribution method.

Solution :

Secondary Distribution Summary

Costs of Service departments	Basis of Apportionment	Total Rs.	Production Departments		
			P_1 Rs.	P_2 Rs.	P_3 Rs.
Amount as per Primary distribution	—		20,000	18,000	25,000
Canteen	No. of employees (6 : 5 : 4)	1,500	600	500	400
Power house (lighting)	No. of light points (3 : 4 : 5)	1,200	300	400	500
Power house (power)	Horse Power (3 : 2 : 3)	4,000	1,500	1,000	1,500
Stores	No. of requisitions (4 : 3 : 5)	3,600	1,200	900	1,500
Time-keeping & Accounts	No. of employees (6 : 5 : 4)	3,000	1.200	1,000	800
Repair Shop	Value of Assets (2 : 3 : 4)	4,500	1,000	1,500	2,000
Total		—	25,800	23,300	31,700

(B) (i) *Apportionment on non-reciprocal basis*

In this case, it is recognised that one service department renders services to other service departments and production departments, but reciprocal services are not recognised. Under this way of apportionment, a distribution statement or analysis sheet is prepared showing therein the service departments in the descending order of their serviceability—the service department serving almost all the other service departments being placed at the top and the service department serving the smallest number of the service departments being placed at the bottom. The cost of the first service department is apportioned on a suitable basis to other service departments and production departments. The first service department account is thereby closed. In this way, one after another, the costs of other service departments are also apportioned Thus, all service departments' costs are apportioned ultimately to the production departments. This method is also known as *step method*. Let us look into the following illustration.

Illustration 3.

From the following particulars of Lindwai Limited show the secondary distribution on non-reciprocal basis :

	Clerical services	Stores	Tool Room	Production shops A	B	C
Direct Labour Cost (Rs.)	—	25,000	50,000	90,000	60,000	50,000
Indirect Materials (Rs.)			30,000	80,000	70,000	40,000
Machine hours				1,00,000	60,000	40,000

	Clerical Services	Stores	Tool Room
	Rs.	Rs.	Rs.
Service departments costs as per primary distribution	27,500	19,500	10,000

	A	B	C
	Rs.	Rs.	Rs.
Production departments costs as per primary distribution	80,500	71,300	67,600

Notes : 1. Clerical services are received by all other service departments and production departments.
2. Store serves Tool Room and production departments.
3. Tool Room serves production departments only.

Solution :

Secondary Distribution Summary

Basis of Redistribution	Service Departments			Production Departments		
	Clerical Services Rs.	Stores Rs.	Tool Room Rs.	A Rs.	B Rs.	C Rs.
Total overheads as per primary distribution	27,500	19,500	10,000	80,500	71,300	67,600
Direct labour cost	−27,500	2,500	5,000	9,000	6,000	5,000
Indirect material cost		−22,000	3,000	8,000	7,000	4,000
Machine hours			−18,000	9,000	5,400	3,600
Total				1,06,500	89,700	80,200

B. (ii) *Apportionment on reciprocal services basis*

Here the reciprocal services amongst the service departments are recognised. Apportionment on this basis is, therefore, more complicated. *Three distinct methods* are in use for apportionment on this basis namely :

(a) Repeated redistribution or continued distribution or attrition method, (b) *Trial and error method,* and (c) *Simultaneous equation method.*

(a) **Repeated Redistribution Method** (*or continued distribution method or attrition method*) :

In this case, the cost of the first service department is apportioned to other service departments and production departments so that the first service department shows a nil balance. The total cost of the second service department including the share of the first is similarly apportioned to other service departments and production departments so that the second service department shows a nil balance. The first service department now gets a share of the second and this amount has to be again apportioned. This process goes on until the balances of the service departments become very small which are then transferred to the production departments only. Apportionment, in every case, is done on the basis of services rendered. Let us examine the following illustration.

Illustration 4.

Lindwal Ltd. has two service departments X and Y and three production departments A, B and C. From the following information prepare a secondary distribution summary on repeated redistribution method.

	X Rs.	Y Rs.	A Rs.	B Rs.	C Rs.
Total as per primary distribution	3,000	3,600	12,000	6,000	4,500
Service rendered	—	15%	25%	10%	50%
	10%	—	20%	40%	30%

Solution :

Secondary Distribution Summary

Total Rs.	Service Deptts.		Production Deptts.			Remarks
	X Rs.	Y Rs.	A Rs.	B Rs.	C Rs.	
29,100	3,000·00	3,600·00	12,000·00	6,000·00	4,500·00	As per primary distribution
	(−)3,000·00	450·00	750·00	300 00	1,500·00	X's Cost apportioned
	nil	4,050·00				
	405·00	−4,050·00	810·00	1,620·00	1,215·00	Y's Cost apportioned
	405	nil				
	−405	60·75	101·25	40 50	202·50	X's further Cost apportioned
	nil	60·75				
	6·08	−60·75	12·15	24·30	18·22	Y's further Cost apportioned
	6·08	nil				
	−6·08	0·91	1·52	0·61	3·04	X's further Cost apportioned
	nil	0·91				
	0·09	−0·91	0·18	0·36	0·28	Y's further Cost apportioned
	−0·09		0·03	0·01	0·05	Amount being small apportioned to production departments only.
	nil	nil				
			13,675·13	7,985·78	7,439·09	29,100·00 (Total)

[*Note* : Ignoring the fractions the amounts are—A Rs. 13,675 ; B Rs. 7,986 and C Rs. 7,439.]

Repeated redistribution—an alternative approach

This alternative approach is made in order to reduce the labour involved in the repeated redistribution method illustrated above. In this short approach the process of repeated redistribution is to be carried out *in respect of service departments only*, the production departments being kept out of mind for the time being. The total cost of each service department as per primary distribution should be first shown. Only that portion of the total cost, as to be borne by other service departments, has to be transferred to the respective service departments. In this way the redistribution will be carried out until the cost of each service department is exhausted or becomes negligible. Now, the ultimate amount of each service department shall be obtained (see the illustration below). Finally, a statement is to be drawn up showing the redistribution of the total service department costs on the basis of the percentages given.

Illustration 5.

Taking the particulars of illustration—4, show the redistribution in respect of service departments *X* and *Y*.

Solution :

(*Calculation in the nearest rupee*)	X Rs.	Y Rs.
Cost as per primary distribution	3,000	3,600
Service Deptt. X 15% to Y	−3,000	450
Y 10% to X	405	−4,050
X 15% to Y	−405	61
Y 10% to X	6	61
X 15% to Y	−6	1
Total (ignoring the negative figures)	**3,411**	**4,112**

Statement showing redistribution of Service Deptt. costs to Production Departments

	X	Y	A	B	C
	Rs.	Rs.	Rs.	Rs.	Rs.
Cost as per Primary Distribution	3,000	3,600	12,000	6,000	4,500
Service department X	−3,411	512	853	341	1,705
Service department Y	411	−4,112	822	1,645	1,234
Total	Nil	Nil	13,675	7,986	7,439

(Thus, whatever way is followed the result shall be the same.)

(b)   Trial and Error Method

In this case, the cost of each service department is apportioned to other service departments only on the basis of services rendered. Since there is reciprocal service, each service department gets share from the other service departments after its own cost is apportioned. So the process has to be repeated until the amount becomes negligible. The cost ultimately coming to the share of each service department (being the total of the shares coming from a number of apportionments) is apportioned to the production departments. This method becomes suitable where two or three interlocked service departments are involved. Let us see what happens in the following illustration.

Illustration 6.

Taking the same particulars as in illustration 4 above, show the working under Trial and Error Method.

Solution :

Service Departments

	X Rs.	Y Rs.	
Amount as primary distribution	3,000·00	3,600·00	
		450·00	15% of Rs. 3,000
		4,050·00	
10% of Rs. 4,050	405·00		
		60·75	15% of Rs. 405
10% of Rs. 60·75	6·08		
		0·91	15% of Rs. 6·08
10% of Rs. 0·91	0·09		
		0·01	
Negligible			
	Rs. 3,411·17	Rs. 4,111·67	

The two amounts Rs. 3,411·17 and Rs. 4,111·67 are subsequently apportioned to production departments A, B and C.

[*If we ignore the fractions the amounts will be Rs. 3,411 and Rs. 4,112 respectively.*]

(c) Simultaneous Equation Method

By application of the data as in illustration 4 relating to the service departments in simultaneous equation, we can mathematically obtain the desired result. This is explained below.

Since X gets service from Y to the extent of 10%, the total cost of X represents its own cost plus 10% of Y's cost. Similarly, the total cost of Y represents its own cost plus 15% of X's cost ; because Y gets service from X to the extent of 15%. Let x be the total cost of X department and y be the total cost of Y department.

Putting the above in equation we get :

$$x = \text{Rs. } 3,000 + 10\% \text{ of } y \text{ or } x = 3,000 + \frac{10y}{100} \qquad \cdots \quad \text{(i)}$$

$$y = \text{Rs. } 3,600 + 15\% \text{ of } x \text{ or } y = 3,600 + \frac{15x}{100} \qquad \cdots \quad \text{(ii)}$$

or, $100x - 10y = 3,00,000$ from (i)
$-15x + 100y = 3,60,000$,, (ii)

or, $1,000x - 100y = 30,00,000$ multiplying (i) by 10 ... (iii)
$\underline{-15x + 100y = \ 3,60,000}$ ... (iv)
$985x \qquad = 33,60,000$ adding (iii) and (iv).

$$\therefore \quad x = \frac{33,60,000}{985} \quad \text{or Rs. } 3,411·17 \text{ [or Rs. } 3,411 \text{]}$$

Putting the value of x in equation (i) we get ·
$100 \times 3411·17 - 10y = 3,00,000$
or, $3,41,117 - 3,00,000 = 10y.$

or, $41,117 = 10y$ or $y = \frac{41,117}{10} = \text{Rs. } 4,111·70 \text{ [or Rs. } 4,112 \text{]}$

ABSORPTION OF OVERHEAD BY PRODUCTION UNITS

We have seen that each production department incurs some expense exclusively for that department. Some expense may be incurred for many production and service departments to be shared by all on some equitable basis. The cost of service departments are reapportioned to production departments. *Thus the total expenses of a production department includes— its own expenses, its share of the joint expenses and its share of the service departments' expenses.* Again, ultimately the grand total of the total expenses of all the production departments shall be equal to the total factory overhead.

The total expense of each production department is to be allotted to the units of output of that department. This allotment is called *absorption of overhead, recovery of overhead, charging of overhead to products etc.*

Certain points to be considered while making an attempt for absorption of overhead. The points are as follows :

1. Absorption should be as accurate as possible i.e., overhead incurred should be fully absorbed.

2. There should not be much clerical work and cost involved in the process of absorption.

3. Production factors, like time of production, skill of workers etc. should be duly considered (e.g. when overhead varies with the time of production, overhead rate should be determined on the basis of time).

4. It should be remembered that, the nature and method of production in every department are not the same. So methods of absorption shall vary from department to department (each department having a method of absorption depending upon its own nature and method of production.)

5. Whatever may be the method of absorption followed by any production department, such method must assure *accurate cost ascertainment* and *appropriate cost control.*

Commonly used methods of absorption

There are various methods of absorption of factory overhead in use which can be grouped under the following three heads : --

(*a*) *Production Unit or Cost Unit Method*

(*b*) *Percentage Methods*

     (*i*) Percentage of Direct Materials

     (*ii*) Percentage of Direct Wages

     (*iii*) Percentage of Prime Cost

(*c*) *Production Time Rate or Hourly Rate Methods*

     (*i*) Direct Labour Hour Rate

     (*ii*) Machine Hour Rate

Let us explain each of the above Methods

(a) Production Unit or Cost Unit Method

Under this method the total *actual* overhead of the department is divided by the total *actual* unit of output to obtain the rate per unit. This is done under historical costing. If the rate is to be obtained before production, the total *predetermined* overhead is divided by the *predetermined* number of production units to obtain the predetermined rate of absorption. The predetermined rate is applied in case of all production.

The method claims to be most simple and direct. It is suitable for only those departments which produce only one product of homogeneous nature or produce more than one product capable of being measured in terms of a common yardstick.

b(*i*) Percentage of Direct Materials Method

The percentage in this case is worked out as below :

$$\frac{\text{Actual (or predetermined) Overhead}}{\text{Actual (or predetermined) Direct Material Cost}} \times 100$$

This method suffers from a *number of limitations* explained below :

(a) Prices of materials always fluctuate and hence, if overhead is charged as a percentage of direct material cost, the amount of overhead charged shall also fluctuate, although overhead cost may remain constant.

(b) Material cost bears no relationship with time factor, but most of the overhead expenses vary with time. Material cost as a basis of overhead recovery fails to recognise time factor and hence is seldom used.

(c) When a job consumes very costly materials but the period of execution of the job is very short, the job is charged with heavy overhead, although the actual overhead (which is dependent upon the period of execution) involved is low. Similarly, when a job consumes very cheap materials but the period of execution is long, it is charged with small amount of overhead, although the actual overhead involved is large. Thus, material cost basis of recovery of overhead does not establish a suitable ground for cost comparison.

b(*ii*) Percentage of Direct Wages Method

The percentage of recovery, in this case, is worked out as below :

$$\frac{\text{Actual (or predetermined) overhead}}{\text{Actual (or predetermined) direct wages}} \times 100$$

The following are the *merits* and *defects* of the method :

Merits :

(a) It is simple to understand and apply.

(b) Direct wages have good relationship with time factor. Higher amount of wages for a job indicates longer period of execution and hence logically higher amount of overhead is involved.

(c) Rates of wages do not always fluctuate like material cost. So direct wages basis is more stable than direct materials basis.

(d) Comparison of costs from period to period becomes more dependable under direct wages method than that under direct materials method.

This method, however, gives most satisfactory result when (i) labour factor is predominant, (ii) production is uniform, and (iii) hourly rates of all workers are more or less the same.

Defects :

(a) The method does not suit the condition when workers are paid on piece wage basis, because of the fact that wages, in that case, depend upon the output and not upon time, but overhead expenses depend largely upon time.

(b) Two workers of the same time rate working for the same period, but one with very costly equipment and the other with hand tools will earn the same wage. Overhead absorbed on direct wage basis shall also be equal, but incidence of overhead in the former work shall be higher than that in the latter work.

(c) When work is carried out with the help of automatic or semi-automatic machines, the worker acts as an attendant. In this case, wages

of the worker bear little relationship with the amount of overhead involved. The overhead is related with the hours of machine work. Thus, where automation has been fully achieved or where in some departments there is automation and in others there is predominance of hand work, the direct wages method shall not be suitable.

b(*iii*) Percentage of Prime Cost Method

The percentage of recovery, in this case, is worked out as below :

$$\frac{\text{Actual (or predetermined) Overhead}}{\text{Actual (or predetermined) Prime Cost}} \times 100$$

This method suits the condition where—(i) a standard product is produced (ii) a standard quantity of material at standard rate is consumed (iii) a standard number of labour hours at standard rate is required for production. Often, all these requirements are not fulfilled.

The advantages claimed of this method are :

(a) The method is very simple to understand and apply.

(b) It recognises both the factors namely, direct material cost and direct wages. To speak more particularly, it recognises time factor.

The objections raised against the method are :

(a) If the material cost is predominant in the prime cost, the time factor does not get its due importance.

(b) Let there are two workers of the same trade and skill. One uses expensive machines while the other works with hand tools. Both the workers get the same wage and this enters into the prime cost. In this case, does the recovery rate (worked out as a percentage of prime cost) take into consideration the additional expense arising out of the use of the expensive machine ?

(c)(*i*) Direct Labour Hour Rate Method

Since overhead largely depends upon the time factor, any recovery rate calculated on the basis of the hours of work shall give accurate result. In factories where hand work is the rule, rate of overhead per direct labour hour is worked out and applied suitably. The rate is computed as below :

$$\frac{\text{Actual (or predetermined) overhead}}{\text{Actual (predetermined) hours of director labour work}}$$

Direct labour hour rate is applicable where—(i) labour factor is predominant in production, (ii) output is not uniform, (iii) any percentage method fails to suit the condition.

A direct labour hour rate may be calculated for each department or for each group of workers.

How much direct labour hours are consumed by a particular job can be obtained from the job cards of the workers. These hours being multiplied by the rate for the department (or group of workers) gives the amount of overhead to be charged to that job.

It must be noted that, for the purpose of working out the recovery ,rate and for charging overhead, *effective hours of work* shall be taken into consideration. The effective hours of work can be obtained by making a provision for normal idle time.

Illustration 7.

X Ltd. has three manufacturing departments *A*, *B*, *C* and one service department *S*.

The following figures are available for one month of 25 working days of 8 hours each day. All departments work all the days with full attendance.

		Service Deptt.	Production Departments		
	Total	*S*	*A*	*B*	*C*
Expenses	Rs.	Rs.	Rs.	Rs.	Rs.
Power & Lighting	1,100	240	200	300	360
Supervisors' Salary	2,000	—	—	—	—
Rent	500	—	—	—	—
Welfare	600	—	—	—	—
Others	1,200	200	200	400	400
	5,400				
Supervisors' Salary		20%	30%	30%	20%
No. of workers		10	30	40	20
Floor area (in sq. ft.)		500	600	800	600
Services rendered by service deptt. to production deptts.			50%	30%	20%

Calculate labour hour rate of each of the departments *A*, *B*. *C*.

(*C. U., B. Com. Hons.*)

Solution :

Statement showing the apportionment of Expenses

Expenses	Basis of Apportionment	Total Rs.	Service Deptt. S Rs.	Production Departments A Rs.	B Rs.	C Rs.
Power & Lighting	Actual	1,100	240	200	300	360
Supervisors' Salary	Services rendered (2 : 3 : 3 : 2)	2,000	400	600	600	400
Rent	Floor space occupied (5 : 6 : 8 : 6)	500	100	120	160	120
Welfare	No. of workers (1 : 3 : 4 : 2)	600	60	180	240	120
Others	Actual	1,200	200	200	400	400
		5,400	1,000	1,300	1,700	1,400
Expenses of S	Given ratio (5 : 3 : 2)		−1,000	+500	+300	+200
Total		5,400	Nil	1,800	2,000	1,600

The man-hours worked during the month—

Deptt. *A* $30 \times 25 \times 8 = 6,000$

  ,,   *B* $40 \times 25 \times 8 = 8,000$

  ,,   *C* $20 \times 25 \times 8 = 4,000$

Labour hour rate—

$$\text{Deptt. } A = \frac{\text{Rs. } 1,800}{6,000} = 30 \text{ P.}$$

$$\text{Deptt. } B = \frac{\text{Rs. } 2,000}{8,000} = 25 \text{ P.}$$

$$\text{Deptt. } C = \frac{\text{Rs. } 1,600}{4,000} = 40 \text{ P.}$$

c(*ii*) Machine Hour Rate (MHR) Method

The actual factory overhead or estimated factory overhead for a period of time being divided by the actual or estimated machine hours during that period gives the machine hour rate.

$$\text{MHR} = \frac{\text{Actual or Estimated Factory overhead}}{\text{Actual or Expected Machine hours}}$$

If the factory overhead for a given period is Rs. 1,000 and the number of machine hours during the same period is 200, the MHR is Rs. 5. If any job engages one of such machines for *one hour*, the factory overhead chargeable for that to the job shall be Rs. 5.

Computation of MHR

All the machines should be classified into groups of similar machines, each group being similar to a production department. The primary distribution of expenses should be done on the basis of these groups and the service departments. Expenses of service departments should be reapportioned to these groups so that each group gets the total overhead to be absorbed by the products using the group of machines. So far as the expected machine hours of a particular group is concerned, we are to work it out and then divide the overhead of the group to be absorbed by these machine hours to get the machine hour rate.

Some considerations before computation of MHR

1. *Machinery setting time and idle time*

The actual or potential hours of work of the machine during a period is taken first. Deduction in respect of machine setting time, *normal idle time*, time lost for normal repairs, maintenance etc. should be done to ascertain the *expected effective hours of work*. Idle time of abnormal character *must not* be taken into consideration for ascertaining the expected effective hours of work. If any abnormal idle time arises, such time, multiplied by the machine hour rate, shall give the idle time cost to be charged to *idle time account*.

2. *Machine Operator*

Cost accountants differ in opinion as to whether wages of the machine operators should be included in the overhead or they should be treated ,as direct wages. Some accountants suggest that, if such wages are included in the computation of MHR, it will mean the conversion of a prime cost element into an overhead element and this will vitiate cost analysis.

The opposite group suggest that *a true and comprehensive* machine hour rate cannot be ascertained if such wages are not included.

Thus, if a comprehensive MHR is desired it may be included, otherwise wages of operators should be treated as direct wage by *not including* it in the computation of MHR.

3. *Depreciation*

Depreciation contains two elements—one element arising out of lapse of time is of fixed nature and the other element arising out of use is variable. It is difficult to ascertain the amounts of the two elements separately. So, depreciation may be treated either as fixed or as variable cost, preferably as the latter, for the purpose of computation of MHR.

Technique of Computation

The items of expenses that constitute the total overhead for a machine or group should be arranged under two group heads –(i) *Standing charges* or *Fixed expenses* and (ii) *Machine expenses* or *Variable expenses.*
The items under the first group head normally are :

Rent and rates, lighting and heating, insurance, supervisors' salary, welfare expenses, consumable stores, sundry supplies etc.
The items under the second group head normally are :

Depreciation, repairs and maintenance, power, lubricants etc.

Amount of each item *(for the period for which the expected effective working hours are given)* shall be collected. The total of the expenses collected under the head *Standing charges or Fixed Expenses* should be divided by the effective hours of work to get standing charges or fixed expenses per hour. This should be extended to the outer column. *Each individual element* under the head *Machine Expenses or Variable Expenses* should be divided by the effective hours of work and the result extended to the outer column. Now, the total of the outer column shall represent the MHR. (See the illustration).

Machine hour rate is suitably applied where machine-work is predominant and the production is not uniform.

The following *advantages* of MHR are claimed :

(a) It ensures an equitable charge where machine work is predominant.

(b) Whether one operator operates several machines or many operators operate one machine, it becomes the best method of recovery.

(c) How long the machine remained idle shall be disclosed by the amount of under absorption divided by the MHR (provided there is no other error in recording).

(d) It takes into consideration the time factor completely and hence is a logical method.

(e) It is not difficult to calculate a predetermined rate and apply the same.

Amongst the *disadvantages* pointed out, the only one that may be recognised is that, it involves much clerical work in recording the data regarding operating time of the machines.

Illustration 8.

A machine purchased for Rs. 50,000 was installed in a shop over one-fifth of its floor area at an additional cost of Rs. 10,000. The working life of the machine as also the scrap value were estimated at 10 years and Rs. 5,000 respectively. From the following details compute the historical hourly rate of the machine.

	Rs.
Rent, Rates of the shop per year	2,500
General lighting of the shop per month	250
Repairs and maintenance for the machine per year	1,500
Insurance premium for the machine per quarter	300
Supervisors' salary per month	500

It is estimated that the supervisor devotes one-fourth of his time for the machine.

The cost of power is Rs. 10 per 100 units and the machine consumes power at the rate of 10 units per hour.

Normal working hours of the machine is estimated at 1,200 ; but during the year it actually worked for 1,000 hours.

(C. U., B. Com. Hons.—Adapted)

Solution :

Statement Showing the Computation of Machine Hour Rate

Deptt./Shop..　　　　　Date of installation.........　　　Life 10 years

Machine No.　　　　　Cost Rs. 50,000　　　　　　　Scrap value Rs. 5,000

　　　　　　　　　　　Installation Exp. Rs. 10,000

Effective Working hours/year 1,000

	Per year	Per hour
	Rs.	Rs.
Fixed Expenses :		
Rent & Rates Rs. 2,500 × ⅕	500	
General Lighting Rs. 250 × 12 × ⅕	600	
Insurance Rs. 300 × 4	1,200	
Supervisor's Salary Rs. 500 × 12 × ¼	1,500	
Fixed expenses for 1,000 hours	3,800	3·80
Variable Expenses :		
Depreciation Rs. $(50,000 + 10,000 - 5,000) \div (1,000 \times 10)$		5·50
Repairs & Maintenance Rs. $(1,500 \div 1,000)$		1·50
Power $\frac{10}{100} \times$ Rs. 10		1·00
Machine Hour Rate		11·80

Over- or under-absorption of overhead

Under historical costing system when recovery rate is ascertained on the basis of *actual figures* the overhead actually incurred equals the overhead recovered. So there is no chance of overhead being over- or under-absorbed ; but when recovery rate is predetermined on the basis of expected or

estimated figures there is every possibility of having a difference between the overhead incurred and overhead recovered or absorbed. Where the amount of overhead incurred exceeds the amount of overhead obsorbed it is called *under-absorption* of overhead. Where the amount of overhead absorbed exceeds the amount of overhead incurred it is called *over-absorption* of overheads.

It may be noted that under-(or over) absorption may arise due to any one or both of the following two reasons :

(i) the actual overhead expenses being more or less than the estimate,

(ii) the actual amount of the absorption base (material cost, wages, hours of work etc., as the case may be) being different from the estimated absorption base.

Treatment of over- or under-absorbed overhead in cost accounts

The treatment of over- or under-absorbed overhead may be done in three different ways—

(a) The amount may be carried forward to the next period's account.

(b) The amount may be written off to Costing Profit & Loss account.

(c) A supplementary rate may be worked out and applied to production.

The *first* method may only be applied where the normal business cycle extends over a number of years. In normal conditions this method could not be popular, because it ignores matching of cost. If conditions justify such carry forward, the amount of over- or under-absorbed overhead is transferred to a *Reserve or Suspense account* to carry forward the same to the next period for absorption.

The *second* method is applied where the amount of over- or under-absorption is insignificant. This small amount is written off to costing Profit & Loss A/c without disturbing the production cost.

The *third* method is applicable where the amount involved has been very considerable owing to—(i) a serious error in estimating overhead, (ii) a major change in the method of production, (iii) a substantial change in the level of activity, (iv) an error in estimating the base of recovery rate, (v) a serious error in computing the rate of recovery etc. Under this method the amount of over- or under-absorbed overhead is adjusted to the values of *Work-in-progress, Finished goods* (not yet sold) and *Factory cost of sales* (i.e., work completed and sold) through supplementary rates. If there is over-absorption, these accounts are credited with supplementary rates, debit being given to Factory Overhead account. If there is under-absorption, these accounts are debited with supplementary rates, credit being given to Factory Overhead account. The aim of applying supplementary rate is to create such effect that actual overhead incurred equals the overhead absorbed. The supplementary rate is worked out on the basis of (i) the money value of each account (Work-in-progress, Finished goods, Factory

cost of sales), (ii) the direct material cost or direct wages in each account, or (iii) labour hours or machine hours in each account. Let us look into the following illustration.

Illustration 9.

From the following particulars calculate supplementary recovery rates on the basis of (i) Money value (ii) Direct wages (iii) Machine hours.

	Rs.
Factory Overhead incurred	75,000
,, ,, absorbed	50,000
Value of Work-in-progress	6,00,000
,, ,, Finished stock (not yet sold)	10,00,000
Factory Cost of sales (work completed and sold during the year)	24,00,000
Direct wages included in—	
Work-in-progress	1,50,000
Finished stock (not yet sold)	2,50,000
Factory Cost of sales	6,00,000
(work completed and sold during the year)	
Machine hours employed in—	
Work-in-progress	—20,000
Finished stock	40,000
Factory Cost of sales	90,000

Solution :

(i) Total value of work-in-progress, finished stock and factory cost of sales = Rs. (6,00,000 + 10,00,000 + 24,00,000) = Rs. 40,00,000

$$\therefore \textit{ Supplementary rate on the basis of money value} = \frac{\text{Rs.} (75,000 - 50,000)}{40,00,000}$$

$$= \text{Re. } \cdot 00625$$

(ii) Total direct wages = (1,50,000 + 2,50,000 + 6,00,000) = Rs. 10,00,000

$$\therefore \text{ Supplementary rate on the basis of direct wages} = \frac{\text{Rs.} (75,000 - 50,000)}{10,00,000}$$

$$= \text{Re. } \cdot 025$$

(iii) Total Machine hours = (20,000 + 40,000 + 90,000) = 1,50,000

$$\therefore \text{ Supplementary rate on the basis of machine hours} = \frac{\text{Rs.} (75,000 - 50,000)}{1,50,000}$$

$$= \text{Re. } \cdot 167$$

Since it is a case of under-absorption of overhead, the supplementary rates shall be debited to the respective accounts (i.e., work-in-progress, finished stock and factory cost of sales and credited to Factory Overhead account).

WORKED-OUT PROBLEMS

Problem 1.

Re : Segregation of fixed and variable overhead

Units produced and overheads incurred during the two periods were as follows :

Month	Units	Overhead
April	20,000	Rs. 60,000
May	22,000	Rs. 63,000

Calculate (i) total fixed overhead, and (ii) variable overhead per unit.

Solution :

Month	Production	Overhead
April	20,000 units	Rs. 60,000
May	22,000 units	Rs. 63,000
Difference	2,000 units	Rs. 3,000

The difference in overhead represents variable overhead. Hence, variable overhead of 2,000 units is Rs. 3,000.

$$\text{Variable overhead per unit} = \frac{\text{Rs. }3,000}{2,000} = \text{Rs. }1\cdot50$$

Total overhead for April[1]	Rs. 60,000
Less : Variable overhead : 20,000 units @ Rs. 1·50	Rs. 30,000
∴ Fixed overhead	= Rs. 30,000

Note : [1]Calculation may be made taking the figures of May as well.

Problem 2.

The following are the maintenance costs incurred in a machine shop per six months with corresponding machine hours :

Month	Machine hours	Maintenance costs
		Rs.
January	1,800	1,400
February	1,300	1,150
March	2,000	1,500
April	1,900	1,450
May	1,600	1,300
June	1,400	1,200
Total	10,000	8,000

Analyse the maintenance cost (which is semi-variable) into fixed and variable elements using (i) the high/low points, and (ii) the least squares method.

Solution ·

(i) *High/Low points method*

	Machine hours	Maintenance cost.
		Rs.
High point, March	2,000	1,500
Low point, February	1,300	1,150
Difference	700	350

$$\text{Variable cost per machine hour} = \frac{\text{Rs. } 350}{700} = \text{Re. } 0\cdot50$$

Maintenance cost for 2,000 hours	= Rs. 1,500
Less : Variable cost for 2,000 hours @ Re. 0·50	= Rs. 1,000
∴ Fixed cost	= Rs. 500

(ii) *Least square method*

Costs	Hours	xy	x^2
(y)	(x)	'000s	'000s
1,400	1,800	2,520	3,240
1,150	1,300	1,495	1,690
1,500	2,000	3,000	4,000
1,450	1,900	2,755	3,610
1,300	1,600	2,080	2,560
1,200	1,400	1,680	1,960
$\Sigma y = 8,000$	$\Sigma x = 10,000$	$\Sigma xy = 13,530$	$\Sigma x^2 = 17,060$

and $n = 6$

Normal equations

$$\Sigma y = an + b\Sigma x$$
$$\Sigma xy = a\Sigma x + b\Sigma x^2$$

Substituting the values in the equations we have—

$$8,000 = 6a + 10,000b \dots\dots\dots(i)$$

$$1,35,30,000 = 10,000a + 1,70,60,000b \dots\dots\dots(ii)$$

Multiplying equation (i) by 5,000 and (ii) by 3 we obtain—

$$4,00,00,000 = 30,000\,a + 5,00,00,000\,b \dots\dots(iii)$$

$$4,05,90,000 = 30,000\,a + 5,11,80,000\,b \dots\dots(iv)$$

$$5,90,000 = 11,80,000\,b \ [\textit{subtracting (iii) from (iv)}]$$

or, $b = \dfrac{5,90,000}{11,80,000}$ or, Re. 0·50 per machine hour (i.e., *variable cost*)

Substituting the value of b in equation (i) we obtain —

$$8,000 = 6a + 10,000 \times 0\cdot50$$

or, $a = \dfrac{8,000 - 5,000}{6} = $ Rs. 500 (i.e., *fixed cost*)

Analysis of maintenance cost into fixed and variable elements

Month	Machine hrs.	Maintenance cost	Fixed cost	Variable cost
		Rs.	Rs.	Rs.
January	1,800	1,400	500	900
February	1,300	1,150	500	650
March	2,000	1,500	500	1,000
April	1,900	1,450	500	950
May	1,600	1,300	500	800
June	1,400	1,200	500	700

Problem 3.

A department, which produces one product, shows the following production and costs for October, November and December, 1989 :

1989	Production (units)	Direct material Rs.	Direct labour Rs.	Prime cost Rs.	Overhead Rs.	Total factory cost Rs.
October	6,200	43,400	34,100	77,500	77,200	1,54,700
November	8,600	60,200	47,300	1,07,500	91,600	1,99,100
December	5,000	35,000	27,500	62,500	70,000	1,32,500
	19,800	1,38,600	1,08,900	2,47,500	2,38,800	4,86,300

(a) Examine the different levels of activity and analyse the above costs according to their behaviour.

(b) Prepare a cost statement for the month of September, 1989 when 7,500 units were produced under conditions similar to those prevailing in October to December.

Solution :

The first step is to calculate the variable cost per unit and the fixed overheads. Monthly change in units produced may be compared with the changes in direct material and direct labour costs in order to find out what relationship exists between output and these costs.

	Units produced	Monthly change in units	Direct material cost Rs.	Change in direct material Rs.	Direct labour cost Rs.	Change in direct labour Rs.
October	6,200	—	43,400	—	34,100	—
November	8,600	2,400	60,200	16,800	47,300	13,200
December	5,000	3,600	35,000	25,200	27,500	19,800

Direct materials :
   November : Rs. 16,800 ÷ 2,400 = Rs. 7 per unit
   December : Rs. 25,200 ÷ 3,600 = Rs. 7 per unit

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Direct labour :

    November :   Rs. 13,200 ÷ 2,400 = Rs. 5·50 per unit
    December :   Rs. 19,800 ÷ 3,600 = Rs. 5·50 per unit

The above calculations show that a change in output causes a change of Rs. 7 per unit in direct materials cost and Rs. 5·50 per unit in direct labour cost. Hence the direct materials and direct labour costs are Rs. 7 per unit and Rs. 5·50 per unit respectively.

A comparison of change in units produced with change in overheads will show the relationship that exists between output and overheads.

	Units produced	*Monthly change in units*	*Overhead expenses*	*Monthly change in overheads*
			Rs.	Rs.
October	6,200		77,200	—
November	8,600	2,400	91,600	14,400
December	5,000	3,600	70,000	21,600
November		Rs. 14,400 ÷ 2,400 = Rs. 6 per unit		
De ember :		Rs. 21,600 ÷ 3,600 = Rs. 6 per unit		

The above calculations show that, a change in output causes a change of Rs. 6 per unit in overheads. Hence the *variable overhead cost* is Rs. 6 per unit. Now the variable overheads may be deducted from the total overhead costs so as to ascertain the *fixed overheads*.

    Fixed overheads = Total overheads *less* Variable overheads
        October   Rs. 77,200 – (6,200 units × Rs. 6) = Rs. 40,000
        November   Rs. 91,600 – (8,600 units × Rs. 6) = Rs. 40,000
        December   Rs. 70,000 – (5,000 units × Rs. 6) = Rs. 40,000

The above calculations show that fixed overheads are Rs. 40,000 per month.

The above analysis of the change in activity levels shows that material costs are Rs. 7 per unit, labour costs are Rs. 5·50 per unit, variable overhead costs are Rs. 6 per unit and fixed overheads are Rs. 40,000 per month.

Cost Statement

(Output : 7,500 units)   *Period : September, 1989*

		Units	Per unit	Cost
			Rs.	Rs.
Direct materials	...	7,500	7·00	52,500
Direct labour	...	7,500	5·50	41,250
Prime cost	...			93,750
Variable overheads	...	7,500	6·00	45.000
Variable cost	...			1,38,750
Fixed overheads	...			40,000
Total factory cost	...			1,78,750

Problem 4.

Re : Calculation of overhead absorption rates

The following information relates to the activities of a production department of a factory for a certain period :

	Rs.	
Materials issued	36,000	
Direct Wages	30,000	
Direct labour hours worked		25,000
Hours of machine operation		20,000
Overheads chargeable to the department	25,000	

If the cost of materials consumed on Job No. 253 is Rs. 2,000 and labour charges amount to Rs. 1,650, ascertain the works cost by the following methods of allocating overheads :

(a) Percentage on Direct Wages

(b) Machine Hour Rate

(c) Direct Labour Hour Rate

Presume that labour hours worked for the job were 1,650 and hours of machine operated for the job were 1,200.

Solution

(a) *Percentage on Direct Wages* ·

$$\frac{\text{Overheads for the Department}}{\text{Direct Wages}} \times 100 = \frac{25,000}{30,000} \times 100 = 83\tfrac{1}{3}\%$$

(b) *Machine Hours Rate* :

$$\frac{\text{Overheads for the Department}}{\text{Hours of Machine Operation}} = \frac{\text{Rs. } 25,000}{20,000} = \text{Rs. } 1·25 \text{ per hour}$$

(c) *Direct Labour Hour Rate* :

$$\frac{\text{Overheads for the Department}}{\text{Labour Hours Worked}} = \frac{\text{Rs. } 25,000}{25,000} = \text{Re. } 1·00 \text{ per hour}$$

Comparative Statement showing Works Cost of Job No. 253

Elements of Cost	Direct Wages Cost Rate	Machine Hour Rate	Direct Labour Hour Rate
	Rs.	Rs.	Rs.
Materials consumed	2,000	2,000	2,000
Direct wages	1,650	1,650	1,650
Prime Cost	3,650	3,650	3,650
Factory Overheads :			
(i) @ 83⅓% of Direct Wages (Rs. 1,650)	1,375		
(ii) @ Rs. 1·25 per hour for 1,200 machine hours		1,500	
(iii) @ Re. 1·00 per hour for 1,650 labour hours			1,650
Works Cost	5,025	5,150	5,300

Problem 5.

The following information relates to the activities of a production department of a factory for a certain period :

Direct materials used	Rs. 40,000
Direct wages	Rs. 60,000
Direct labour hours worked 25,000 (*including 20,000 hours of machine operation*)	
Overhead chargeable to the department Rs. 50,000	

For Order No. 156 carried out in the department, the relevant data were :

Direct materials used	Rs. 3,000
Direct wages	Rs. 2,100

Direct labour hours 820 (*including 800 hours of machine operation*)

You are required to calculate the overhead chargeable to Order No. 156 by five different cost rates. (The rates you select should, between them, utilise all the data shown above in connection with Order No. 156).

Solution :

(1)   Direct Materials Cost Percentage Rate $= \dfrac{50,000}{40,000} \times 100 = 125\%$

Overhead chargeable to Order No. 156 = 125% of Rs. 3,000
$$= \text{Rs. } 3,750$$

(2)   Direct Wages Percentage Rate $= \dfrac{50,000}{60,000} \times 100 = 83\tfrac{1}{8}\%$

Overhead chargeable to Order No. 156 = $83\tfrac{1}{8}\%$ of Rs. 2,100
$$= \text{Rs. } 1,750$$

(3)   Prime Cost Percentage Rate $= \dfrac{50,000}{1,00,000} \times 100 = 50\%$

Overhead chargeable to Order No. 156 = 50% of Rs. (3,000+2,100)
$$= \text{Rs. } 2,550$$

(4)   Labour Hour Rate $= \dfrac{\text{Rs. } 50,000}{25,000} = \text{Rs. } 2$ per hour

Overhead chargeable to Order No. 156 = Rs. 2×820 = Rs. 1,640

(5)   Machine Hour Rate $= \dfrac{\text{Rs. } 50,000}{20,000} = \text{Rs. } 2 \cdot 50$ per hour

Overhead chargeable to Order No. 156 = Rs. 2·50×800 = Rs. 2,000.

Problem 6.

Department *X* makes two products *A* and *B*. The departmental budgeted overheads for *X* are Rs. 48,000, and the budgeted production is

A—4,000 units, *B*—1,600 units. The estimated prime cost of *A* and *B* was calculated as below :

A	*B*
Material 48 kg. of code 562 at Re. 0·25 per kg. = Rs. 12·00	30 kg. of code 253 at Re. 0·20 per kg. = Rs. 6·00
Labour 5 hrs. (of which 2 hrs. are on a machine) at Re. 0·80 per hr. = Rs. 4·00	25 hrs. (of which 10 hrs. are on a machine) at Re. 0·40 per hr. = Rs. 10·00
Rs. 16·00	Rs. 16·00

Calculate three different overhead recovery rates and show the overhead for 1 unit of *A* and also 1 unit of *B*.

Solution :

(*i*) *Labour Hour Rate* :

Total direct labour hours = $(5 \times 4,000) + (25 \times 1,600) = 60,000$ hrs.

Labour hour rate = $\dfrac{\text{Rs. } 48,000}{60,000}$ = Re. 0·80 per hr.

Overhead for : A = Re. 0·80 × 5 = Rs. 4·00

B = Re. 0·80 × 25 = Rs. 20·00

(*ii*) *Machine Hour Rate* :

Total machine hours = $(2 \times 4,000) + (10 \times 1,600) = 24,000$ hrs.

Machine hour rate = $\dfrac{\text{Rs. } 48,000}{24,000}$ = Rs. 2 per hr.

Overhead for : A = Rs. 2 × 2 = Rs. 4

B = Rs. 2 × 10 = Rs. 20

(*iii*) *Direct Wages Percentage Rate* :

Total direct wages = Rs. $(4 \times 4,000)$ + Rs. $(10 \times 1,600)$ = Rs. 32,000

Direct wages percentage rate = $\dfrac{48,000}{32,000} \times 100 = 150\%$

Overhead for : A = 150% of Rs. 4 = Rs. 6

B = 150% of Rs. 10 = Rs. 15

Problem 7.

The following expenses have been incurred for the month of April, 1989, in respect of a department of a factory :

Rent and rates	Rs. 400
Light	Rs. 70
Supervision	Rs. 800
Oil, cotton waste etc.	Rs. 30

The man-hours worked in the month are 5,200. The power charge is 9 paise per hour. The hourly rate of tool depreciation is 6 paise.

Calculate the Labour Hour Rate from the above data. Also find the factory cost of an article when the material cost is Rs. 5 and the direct wages booked for the article in the job card are 20 hours at 50 paise per hour.

Solution :

Labour Hour Rate

		Per month	Per hour
Fixed Expenses :		Rs.	Rs.
Rent & Rates	...	400	
Light	...	70	
Supervision	...	800	
Oil, cotton waste etc.	...	30	
For 5.200 hours	...	1.300	0·25
Variable Expenses :			
Power	...		0·09
Depreciation	...		0·06
Overhead rate per labour hour	...		0·40

Calculation of cost of an article

		Rs.
Materials	...	5·00
Direct Wages : 20 hours @ Re. 0·50 per hour	..	10·00
Prime Cost	...	15·00
Factory Overhead : 20 hours @ Re. 0·40 per hour	...	8·00
Factory Cost	...	23·00

Problem 8.

A company produces four types of products *P*, *Q*, *R* and *S*, each of which is processed in two cost centres—one by machines in the turning shop, and one manually in the finishing shop. The prime cost per unit of each product is as follows :

	P	*Q*	*R*	*S*
Products	Rs.	Rs.	Rs.	Rs.
Direct Labour Cost				
Turning (machine)				
10 hours at Rs. 2 per hour	20			
12 hours at Rs. 2 per hour		24		
15 hours at Rs. 2 per hour			30	
18 hours at Rs. 2 per hour				36
Finishing (mannual)				
15 hours at Rs. 1·50 per hour	22·5			
18 hours at Rs. 1·50 per hour		27		
20 hours at Rs. 1·50 per hour			30	
24 hours at Rs. 1·50 per hour				36
Total Direct Labour cost per unit	42·5	51	60	72
Direct Material cost per unit	31·5	24	12	38

For the three months to 30th September, the budget figures are :

Output :　P　4,000 units　　　　*Overhead* :
　　　　　Q　2 000 units　　　　Turning Department　　Rs. 1,18.300
　　　　　R　1 000 units　　　　Finishing Department　　Rs. 1.06.200
　　　　　S　5,000 units

You are required to calculate an appropriate labour based overhead recovery rate for each department and show the sale price per unit of each type of product, assuming a profit margin of 20% on total cost.

Solution

Budgeted hours	*Turning Department*		*Finishing Department*	
P	10 × 4,000	40 000	15 × 4 000	60 000
Q	12 × 2 000	24 000	18 × 2 000	36,000
R	15 × 1 000	15 000	20 × 1 000	20 000
S	18 × 5.000	90 000	24 × 5,000	1,20 00
		1 69 000 hrs.		2 36 000 hrs
Overhead rate	Rs. 1 18 300		Rs. 1 05 200	
	1 69 000		2 36 000	
	= Re. 0·70 hr.		= Re. 0·45 hr.	

Statement showing the selling price of the products

	P	Q	R	S
Products	Rs.	Rs.	Rs.	Rs.
Direct Material	31·50	24 00	12 00	38·00
Direct labour	42·50	51·00	60 00	72·00
Overhead :				
10 hrs. @ 0·70	7·00			
12 ,, @ 0·70		8·40		
15 ,, @ 0·70			10 50	
18 ,, @ 0·70				12·60
15 ,, @ 0 45	6·75			
18 ,, @ 0·45		8·10		
20 ,. @ 0·45			9·00	
24 ,, @ 0·45				10 80
Total cost	87·75	91·50	91·50	133·40
Profit margin 20%,	17 55	18·30	18·30	26·68
Sale price	105 30	109 80	109·80	160 08

Problem 9.

In a jobbing factory with two departments, the budget of expenses for the coming year shows the following :

	Rs.
Direct wages : Department *A*	34,520
,, *B*	21,520
General factory expenses	11,400
Expenses directly allocated to :	
Department *A*	41,600
,, *B*	13,000
Indirect factory wages	4,000

An analysis of general factory expenses shows that 60% relates to Department *A* and 40% to Department *B,* whilst indirect factory wages apply equally to each department. The wages rates paid per hour are :

Department *A* : Re. 0·80 ; Department *B* : Re. 0·50.

You are required to calculate two methods of absorbing overhead that can be obtained from the above data.

Solution :

	Deptt. A	Deptt. B
Direct wages	Rs. 34,520	Rs. 21,520
Rate per hour	Re. 0·80	Re. 0·50
Direct Labour Hours (Wages÷Rate)	43,150	43,040

	Deptt. A	Deptt. B
	Rs.	Rs.
Total Factory Overhead :		
General factory expenses (Rs. 11,400 in the ratio of 60 : 40)	6,840	4,560
Expenses directly allocated	41,600	13,000
Indirect factory wages (Rs. 4,000 equally)	2,000	2,000
	50,440	19,560

Overhead Rates :

(1) Percentage of Direct Wages

$$\frac{50,440}{34,520} \times 100 \qquad \frac{19,560}{21,520} \times 100$$

$$= 146\% \qquad = 91\%$$

(2) Per Direct Labour Hour

$$\frac{Rs.\ 50,440}{43,150} \qquad \frac{Rs.\ 19,560}{43,040}$$

$$Rs.\ 1·17 \qquad = Re.\ 0·45$$

Problem 10.

XYZ Ltd. manufacture a number of different sizes of product *P.* They have grouped various sizes of *P* into four main groups called *A, B, C* and *D* groups. If the company manufacture only one group in the factory, the monthly production can be either Nos. 5,000 of *A* group, or Nos. 10,000 of *B* group, or Nos. 15,000 of *C* group, or Nos. 30,000 of *D* group. From the following information, you are required to find the profit / loss made on each group of product showing prime cost, works cost, and total cost :

Product group	A	B	C	D
Actual production during a month (Nos.)	675	1,800	4,050	9,450
Cost :	Rs.	Rs.	Rs.	Rs.
Direct labour	3,000	5,500	7,500	21,000
Direct material	3,500	6,500	9,000	27,500
Sale price per unit	30	20	15	12

Overhead expense for the month is Rs. 81,000. Selling and distribution cost is to be calculated @ 10% of works cost. Overhead expenses are to be allocated to each product on the basis of number of units produced.

(I. C. W. A. Inter.)

Solution :

Since the four groups of products are not uniform, the amount of overhead for the month will be apportioned on the basis of equivalent units.

5,000 units of A = 10,000 units of B = 15,000 units of C = 30,000 units of D i.e., 1 unit of A = 6 units of D

$$1 \ '' \ B = 3 \ '' \ ''$$
$$1 \ '' \ C = 2 \ '' \ ''$$

Now,   675 units of A = 675×6 or 4,050 units of D

1,800 '' B = $1,800 \times 3$ or 5,400 ''   ''   ''

4,050 '' C = $4,050 \times 2$ or 8,100 ''   ''   ''

9,450 '' D = $9,450 \times 1$ or 9,450 ''   ''   ''

Total   27,000   ''   ''   ''

$\therefore$ Overhead rate in terms of $D = \dfrac{\text{Rs. } 81,000}{27,000}$ or Rs. 3 per unit

Overhead expenses for Group A = $4,050 \times$ Rs. 3   = Rs. 12,150

B = $5,400 \times$ Rs. 3   = Rs. 16,200

C = $8,100 \times$ Rs. 3   = Rs. 24,300

D = $9,450 \times$ Rs. 3   = Rs. 28,350

Rs. 81,000

Statement of Cost

	Group A	Group B	Group C	Group D
	Rs.	Rs.	Rs.	Rs.
Direct Material ...	3,500	6,500	9,000	27,500
Direct Wages ...	3,000	5,500	7,500	21,000
Prime Cost ...	6,500	12,000	16,500	48,500
Overhead ...	12,150	16,200	24,300	28,350
Works Cost ...	18,650	28,200	40,800	76,850
Selling and Distribution cost @ 10% of works cost ...	1,865	2,820	4,080	7,685
Total Cost ...	20,515	31,020	44,880	84,535
Profit (Loss) ...	(265)	4,980	15,870	28,865
Sale Price ...	20,250	36,000	60,750	1,13,400

Problem 11.

Re : Over/under-absorption

The budgeted working conditions for a cost centre are as follows :

Normal working week	42 hours
Number of machines	14
Normal weekly loss of hours on maintenance etc.	5 hours per machine
Estimated annual overhead	Rs. 62,160
Estimated direct wages rate	Re. 0·75 per hour
Number of weeks worked per year	48

Actual results in respect of a 4-week period are :

Overhead incurred   Rs. 5,100
Wages incurred   Rs. 1,850
Machine hours produced   2,100

You are required to (*a*) calculate the overhead rate per machine hour and (*b*) calculate the amount of under- or over-absorption of both wages and overhead.

Solution :

(*a*) Normal working hours p.a.
(No. of machines × hrs. per week × No. of weeks p.a.)

14 × 42 × 48	28,224 hrs.
Normal loss of hours on maintenance etc. p.a. 14 × 5 × 48	3,360 "
Effective working hours p.a.	24,864 "

$$\text{Machine hour rate} = \frac{\text{Rs. } 62,160}{24,864} = \text{Rs. } 2\cdot50$$

		Rs.
(*b*)	Overhead absorbed : 2,100 hrs. @ Rs. 2·50	5,250
	Overhead incurred	5,100
	Over-absorption	Rs. 150
	Wages absorbed : (14 × 42 × 4) hrs. @ Re. 0·75	1,764
	Wages incurred	1,850
	Under-absorption	Rs. 86

Problem 12.

A manufacturing company has four production departments. Overhead is absorbed by its production departments by means of departmental rates per direct labour hour.

In a particular year there was a large difference between the overhead incurred and overhead absorbed. On analysis you get the following information :

	Departments			
	1	*2*	*3*	*4*
	Rs.	Rs.	Rs.	Rs.
Overhead incurred	12,320	44,385	18,180	16,720
Actual direct labour hours worked	30,800	80,700	40,400	30,400
Estimated departmental rate used	0·50	0·45	0·40	0·50
Total overhead absorbed	15,400	36,315	16,160	15,200
Direct Labour hours contained in :				
Work-in-progress	3,000	10,400	1,900	7,200
Finished goods	4,300	8,300	4,000	2,900

You are required to (*a*) calculate for each department the direct labour hour rate of overhead incurred, (*b*) calculate the extent to which

the values of work-in-progress and finished goods be increased or decreased for each department for the year, in view of corrected rates, (c) what will be the impact on total profit of the company, in view of the correction in (b) above. *(I. C. W. A. Inter.)*

Solution :

(a) *Actual direct labour hour rates of overhead incurred :*

Department	1	2	3	4
(i) Overhead incurred (Rs.)	12,320	44,385	18,180	16,720
(ii) Actual direct labour hours worked	30,800	80,700	40,400	30,400
Rate (i)÷(ii)	Re. 0·40	Re. 0·55	Re. 0·45	Re. 0·55

(b) *Increase/decrease in values of work-in-progress and finished goods :*

Department	1	2	3	4	Total
	Rs.	Rs.	Rs.	Rs.	Rs.
Overhead absorption rate used	0·50	0·45	0·40	0·50	
Actual rate	0·40	0·55	0·45	0·55	
Under-(a) or over-(b) absorption per hour	(b)0·10	(a)0·10	(a)0·05	(a)0·05	
Labour hrs. in W.I.P.	3,000	10,400	1,900	7,200	
Adjustment in value of W.I.P.[1]	(−)300	(+)1,040	(+)95	(+)360	(+)1,195
Labour hrs. in finished goods	4,300	8,300	4,000	2,900	
Adjustment in value of finished goods	(−)430	(+)830	(+)200	(+)145	(+)745
Net increase in value					(+)1,940

(c) As a result of the correction, total profit will increase by Rs. 1,940.

> *Note :* [1]In case of under-absorption i.e. (a), the adjustment is to be done by adding and in case of over-absorption i.e. (b), the adjustment is to be done by deducting.

Problem 13.

In a factory department there are three machines to which the following expenses have been allocated :

A : Rs. 639 ; *B* : Rs. 607 ; *C* : Rs. 951

In addition, there is an overhead crane to bring materials to the machines as necessary. The expenses allocated to this crane are Rs. 570.

During the period of this expenditure, the machines were used as follows :

	A Hours	*B* Hours	*C* Hours
Use of crane	160	130	480
Without use of crane	428	577	—
	588	707	480

Calculate a machine-rate for each machine, distinguishing between the hours in which the crane is used and those in which it is not.

(I. C. W. A., Inter.)

Solution :

Machine Hour Rates

			Machines		Crane
			B	C	
(i)	Expenses allocated	Rs.	639	607	951	570
(ii)	Total hours run	Hrs.	588	707	480	770[1]
(iii)	*Separate hourly rate* (i) ÷ (ii)	Rs.	1·09	0·86	1·98	0·74
(iv)	Add hourly rate of crane expenses when the crane is in use	Rs.	0·74	0·74	0·74	
	Inclusive hourly rate (iii) + (iv)	Rs.	1·83	1·60	2·72	

Working Note : [1]Total hours of work of crane = 160 + 130 + 480 or 770 hours.

Problem 14.

Re :   Allocation and apportionment

A machine shop contains four newly purchased machines, each occupying practically equal area and costing respectively : *A*—Rs. 10,000, *B*—Rs. 12,500, *C*—Rs. 15,000 and *D*—Rs. 20,000. The following are the expenses per annum of the machine shop :

Rent Rs. 5,000 ; Rates and water Rs. 2,125 ; Light and heat Rs. 1,575 ; Power—*A* Rs. 2,550, B Rs. 2,500, *C* Rs. 6,000, *D* Rs. 7,250 ; Administration —Rs. 4,750 ; Running expenses, works sundries, lubricating, repairs etc. Rs. 10,000.

Prepare a machine hour rate for each machine, assuming a 44-hour week, 50 weeks per year, 80% utilisation and the life of machine being 10 years without any scrap value. *(I. C. W. A. Final Eng. Adapted)*

Solution :

Machine Hour Rates

Items of Expenses	Basis of apportionment	Total Rs.	Machines			
			A	B	C	D
			Rs.	Rs.	Rs.	Rs.
Fixed Expenses :						
Rent	Space occupied	5,000	1,250	1,250	1,250	1,250
Rates and water	Space occupied	2,125	531	531	531	532
Light and heat	Space occupied	1,575	394	394	394	393
Administration	Space occupied	4,750	1,187	1,187	1,188	1,188
Depreciation	Actual	5,750	1,000	1,250	1,500	2,000
Variable Expenses						
Power	Allocation	18,300	2,550	2,500	6,000	7,250
Running expenses etc.[1]	Power consumed	10,000	1,393	1,366	3,279	3,962
Total		47,500	8,305	8,478	14,142	16,575
Effective Working hours[2]			1,760	1,760	1,760	1,760
Machine hour rate			4·72	4·82	8·04	9·42

Working Notes :

[1]Running expenses, works sundries etc. could have been distributed on the basis of working hours.

[2]Effective working hours $= 44 \times 50 \times \frac{80}{100} = 1,760$.

Problem 15.

Particulars of 3 machines used in a factory are as under (six-week period : 160 hours working) :

	Machine No. 1	Machine No. 2	Machine No. 3
Cost of machine	Rs. 10,000	Rs. 15,000	Rs. 20,000
Number of workers	2	5	10
Direct wages	Rs. 300	Rs. 800	Rs. 1,200
Power	Rs. 45	Rs. 80	Rs. 150
Light points	2	4	6
Area occupied	100 sq. ft.	250 sq. ft.	400 sq. ft.

The expenses incurred during the period were as follows :

	Rs.
Power	275
Lighting	48
Rent and rates	450
Depreciation	1,350
Repairs	1,800
Indirect wages	460
Canteen expenses	51
Sundries	300

Compute the machine-hour rate for each machine.

(*C. U., B. Com. Hons.*)

Solution :

Machine Hour Rates

Items of expenses	Basis of apportionment	Total Rs.	No. 1 Rs.	No. 2 Rs.	No. 3 Rs.
Fixed Expenses :					
Lighting	Light points (1 : 2 : 3)	48	8	16	24
Rent and rates	Area occupied (2 : 5 : 8)	450	60	150	240
Indirect wages	Direct wages (3 : 8 : 12)	460	60	160	240
Canteen expenses	No. of workers (2 : 5 : 10)	51	6	15	30
Sundries	Hours worked i.e., equal	300	100	100	100
Variable Expenses					
Power	Allocation	275	45	80	150
Depreciation	Cost of machine (2 : 3 : 4)	1,350	300	450	600
Repairs	Cost of machine (2 : 3 : 4)	1,800	400	600	800
	Total	4,734	979	1,571	2,184
Working hours		---	160	160	160
Machine hour rates		—	6·12	9·82	13·65

Note : Direct wages (which will be charged directly to the jobs concerned) have not been considered in computing machine hour rates.

Problem 16.

A production department of a manufacturing company has five different groups of machines, for each of which it is desired to establish machine hour rate. A budget for this department for the year ending on 30th June, 1990 shows the following overheads :

		Rs.	Rs.
Consumable supplies : Machine group	1	3,000	
	2	6,000	
	3	10,000	
	4	12,000	
	5	19,000	
			50,000
Maintenance : Machine group	1	7,000	
	2	8,000	
	3	12,000	
	4	17,000	
	5	10,000	
			54,000
Power			44,000
Rent and rates			48,000
Heat and light			8,000
Insurance of buildings			4,000
Insurance of machinery			10,000
Depreciation of machinery			1,60,000
Supervision			96,000
General expenses			12,000
			4,56,000

Additional operating information is available as follows :

Group	Effective H. P.	Area occupied sq. ft.	Book value of machinery Rs.	Machine working hours
1	10	500	50,000	24,000
2	40	1,500	2,50,000	40,000
3	20	200	1,00,000	16,000
4	50	1,000	4,00,000	20,000
5	80	800	2,00,000	60,000
	200	4,000	10,00,000	1,60,000

You are required to :

(*a*) Calculate a machine hour rate for each of the five groups of machines. Show clearly the basis of apportionment that you use ;

(*b*) Calculate the overhead that will be absorbed by one unit of product *A* and one unit of product *B* on the manufacture of which the

following times (in hours) are spent in the machine groups of this department :

Machine group	1	2	3	4	5
Product *A* (each unit)	2	—	7	1	2
Product *B* (each unit)	4	1	—	6	1

Solution :

(a)   **Computation of Machine Hour Rates**

Items of expenses	Basis of apportionment	Total Rs.	Machine Group				
			1	2	3	4	5
			Rs.	Rs.	Rs.	Rs.	Rs.
Consumable supplies	Allocation	50,000	3,000	6,000	10 000	12,000	19,000
Maintenance	Allocation	54,000	7,000	8,000	12,000	17,000	10,000
Power	H.P. × Machine-hours	14 000	422	2,814	563	1,759	8 442
Rent and rates	Area	48,000	6,000	18,000	2,400	12,000	9,600
Heat and light	Area	8,000	1,000	3 000	400	2 000	1 600
Insurance of building	Area	4 000	500	1 500	200	1,000	800
Insurance of machinery	Book value	10,000	500	2,500	1 000	4 000	2,000
Depreciation of machinery	Machine hours	1 60,000	24,000	40,000	16 000	20 000	60,000
Supervision	Area	96 000	12,000	36,000	4 800	24,000	19,200
General expenses	Area	12,000	1,500	4,500	600	3,000	2,400
Total		**4,56,000**	**55,922**	**1,22,314**	**47,963**	**96,759**	**1,33,042**
Machine hours			24,000	40,000	16,000	20,000	60,000
Machine hour rates			2·330	3·058	2·998	4·838	2·217

Note : Depreciation could have been distributed on the basis of value of machinery and general expenses could have been distributed on the basis of working hours.

(b) Absorption of overhead :

	Product A Rs.	*Product B* Rs.
Machine Group 1	2 × Rs. 2·330 = 4·660	4 × Rs. 2·330 = 9·320
2	—	1 × Rs. 3·058 = 3·058
3	7 × Rs. 2·998 = 20·986	—
4	1 × Rs. 4·838 = 4·838	6 × Rs. 4·838 = 29·028
5	2 × Rs. 2·217 = 4·434	1 × Rs. 2·217 = 2·217
	34·918	43·623

Problem 17.

The Enfield India Ltd. is divided into four departments *A, B* and *C* are Production Departments and *D* is a Service Department. The actual costs for October, 1989 are as follows :

	Rs.
Rent	1,000
Repairs to plant	600
Depreciation of plant	450
Light	100
Supervision	1,500
Fire insurance (stock)	500
Power	900
Employer's State Insurance contribution	150

The following information is available in respect of the four departments :

	A	B	C	D
Area (sq. ft.)	1,500	1,100	900	500
No. of employees	20	15	10	5
Direct wages (Rs.)	6,000	4,000	3,000	2,000
Value of plant (Rs.)	24,000	18,000	12,000	6,000
Value of stock (Rs.)	15,000	9,000	6,000	

Apportion the costs to the various departments by preparing Overhead Distribution Summary Chart.

Solution :

Overhead Distribution Sheet

Period : October, 1989

Items of expenses	Basis of Apportionment	Total Rs.	Production Departments			Service Department
			A	B	C	D
			Rs.	Rs.	Rs.	Rs.
Rent	Area	1,000	375·00	275·00	225·00	125·00
Repairs to plant	Value of plant	600	240·00	180·00	120·00	60·00
Depreciation of plant	Value of plant	450	180·00	135·00	90·00	45·00
Light	Area	100	37·50	27·50	22·50	12·50
Supervision	No. of employees	1,500	600·00	450·00	300·00	150·00
Fire insurance (stock)	Value of stock	500	250·00	150·00	100·00	—
Power	Direct wages[1]	900	360·00	240·00	180·00	120·00
Employer's State Insurance contribution	Direct wages	150	60·00	40·00	30·00	20·00
Direct wages[2]	Actual	2,000	—	—	—	2,000·00
Total		7,200	2,102·50	1,497·50	1,067·50	2.532·50

Notes :

[1] Suitable basis for apportionment of power is not available from the information given in the problem. It has been apportioned on the basis of direct wages keeping in view that both power and direct wages depend upon the period of work. Here also the basic assumptions are—(i) wages are paid on time basis ; (ii) wage rates in different departments are standardised ; (iii) proportion of manual and machine work in different departments is more or less the same ; (iv) the horse power rating in different departments is more or less the same.

[2] Service departments usually do not have any tangible output of their own. They render services to the production departments. Hence, all the revenue expenses of the service departments (including direct wages and direct materials) are in fact overhead expenses to be apportioned to the production departments.

[3] Had it been stated in the problem to distribute the expenses to various *production departments*, the expenses of service department 'D' would also -have been apportioned to the production departments 'A', 'B' and 'C' on the basis of services rendered.

Problem 18.

Re :   Redistribution of service department costs

A company has three production departments, A, B, and C, and a service department S. The overhead costs incurred during a particular four-week period were :

Indirect wages and salaries :

	Rs.	Rs.
Deptt. *A*	40,000	
Deptt. *B*	30,000	
Deptt. *C*	35,000	
Deptt. *S*	25,000	1,30,000
Workmen's compensation insurance		7,800
Rent and rates		6,000
Repairs to plant and machinery		6,000
Depreciation of plant and machinery		4,500
Electricity		3,000
Power		5,600
Insurance		3,500
Medical costs		240

The following information is also available :

	Deptt. *A*	Deptt. *B*	Deptt. *C*	Deptt. *S*
Area in square feet	10,000	8,000	7,000	5,000
Number of employees	20	12	15	13
Book value of plant and machinery (Rs.)	1,00,000	Rs. 1,20,000	Rs. 60,000	Rs. 20,000
Average stock (Rs.)	20,000	Rs. 15,000	Rs. 15,000	—
Horse power of machines	120	95	55	10

Carry out the allocation and apportionment of overhead to the production departments assuming that service department *S* is a canteen.

Solution

Overhead Distribution Sheet

Period : 4-week ended.

Items of expenses	Basis of apportionment	Total Rs.	Production Departments			Service Deptt.
			A	B	C	S
			Rs.	Rs.	Rs.	Rs.
Indirect wages and salaries	Allocation	1,30,000	40,000	30,000	35,000	25,000
Workmen's compensation insurance	Indirect wages and salaries	7,800	2,400	1,800	2,100	1,500
Rent and rates	Area (sq. ft.)	6,000	2,000	1,600	1,400	1,000
Repairs to plant and machinery	Book value	6,000	2,000	2,400	1,200	400
Depreciation of plant and machinery	Book value	4,500	1,500	1,800	900	300
Electricity	Area (sq. ft.)	3,000	1,000	800	700	500
Power	H.P. of machinery	5,600	2,400	1,900	1,100	200
Insurance	Book value of Plant & machinery plus average stock	3,500	1,200	1,350	750	200
Medical costs	No. of employees	240	80	48	60	52
		1,66,640	52,580	41,698	43,210	29,152
Service Deptt. (Canteen)	No. of employees	—	12,405	7.443	9,304	—
Total		1,66,640	64,985	49,141	52,514	—

Problem 19.

A company, having two Production Departments and one Service Department, furnishes the following particulars :

	Rs.
Power	1,000
Lighting	800
Rent and Rates	4,000
Indirect Wages	2,000
Sundries	5,000
Depreciation of Machinery	6,000

The other particulars are :

	Production Departments		Service Department
	I	II	
Working Hours	4,000	3,500	3,600
Direct Wages (Rs.)	3,000	Rs. 2,600	Rs. 3,000
Cost of Machinery (Rs.)	25,000	Rs. 20,000	Rs. 15,000
Horse Power of Machinery	50	30	10
Light Points (Nos.)	18	12	10
Floor Space (sq. ft.)	1,000	1,200	800

The expenses of the Service Department are to be allocated between Production Departments I and II in the ratio of 60 : 40.

Apportion the costs to the various departments on the most equitable basis.　　　　　　　　　　　　　　　　　　(C. U., B. Com. Hons.)

Solution .

Overhead Distribution Sheet

Period............

Items of expenses	Basis of Apportionment	Total Rs.	Production Deptts.		Service Department Rs.
			I Rs.	II Rs.	
Direct wages	Actual	3,000	—	—	3,000·00
Power	H.P.×Working hours (200 : 105 : 36)	1,000	586·51	307·92	105·57
Lighting	Light points (18 : 12 : 10)	800	360·00	240·00	200·00
Rent and Rates	Floor space (10 : 12 : 8)	4,000	1,333·33	1,600·00	1,066·67
Indirect wages	Working hours (40 : 35 : 36)	2,000	720·72	630·63	648·65
Sundries	Working hours (40 : 35 : 36)	5,000	1,801·80	1,576·58	1,621·62
Depreciation	Cost of machinery (5 : 4 : 3)	6,000	2,500·00	2,000·00	1,500·00
		21,800	7,302·36	6,355·13	8,142·51
Service Department	Given ratio (60 : 40)	—	4,885·51	3,257·00	−8,142·51
Total		21,800	12,187·87	9,612·13	—

Problem 20.

Calcutta Engineering Co. has three Production Departments X, Y and Z and one Service Department S.

From the following particulars calculate Labour Hour Rate of each of the departments X, Y and Z :

Expenses	**Rs.**
Rent	34,000
Power	18,400
Depreciation on Machinery	22,000
Indirect Wages	5,300
Canteen Expenses	5,700
Electricity	4,600

Further information :	X	Y	Z	S
Floor space (sq. m.)	2,000	3,000	2,500	1,000
Light points	18	12	10	6
Cost of Machines (Rs.)	80,000	50,000	60,000	10,000
Horse power hours ratio	3	2	4	1
No. of workers	7	5	5	2
Direct wages (Rs.)	15,000	16,000	18,000	4,000

There were 125 working days of 8 hours each. Services rendered by the Service Department are to be apportioned to the Production Departments as X 50%, Y 25% and Z 25%. (*C. U., B. Com. Hons. '82—Adapted*)

Solution :

Overhead Distribution Sheet

Period.

Items of expenses	Basis of apportionment	Total Rs.	Production Departments			Service Deptt. S Rs.
			X Rs.	Y Rs.	Z Rs.	
Direct wages	Actual	4,000	—	—	—	4,000
Rent	Floor space (4 : 6 : 5 : 2)	34,000	8,000	12,000	10,000	4,000
Power	H.P. hour ratio (3 : 2 : 4 : 1)	18,400	5,520	3,680	7,360	1,840
Depreciation	Cost of machine (8 : 5 : 6 : 1)	22,000	8,800	5,500	6,600	1,100
Indirect wages[1]	Direct wages (15 : 16 : 18 : 4)	5,300	1,500	1,600	1,800	400
Canteen expenses	No. of workers (7 : 5 : 5 : 2)	5,700	2,100	1,500	1,500	600
Electricity	Light points (9 : 6 : 5 : 3)	4,600	1,800	1,200	1,000	600
		94,000	27,720	25,480	28,260	12,540
Apportionment of service department expenses	% of services rendered	—	6,270	3,135	3,135	−12,540
Total		94,000	33,990	28,615	31,395	—
Labour hours worked[*]			7,000	5,000	5,000	—
Labour hour rates			4·855	5·723	6·279	—

Working Notes :

    'Indirect wages may be apportioned on any other suitable basis.

    'Labour hours worked :   Deptt. *X* 125 × 8 × 7 = 7,000

                      ,,   *Y* 125 × 8 × 5 = 5,000

                      ,,   *Z* 125 × 8 × 5 = 5,000

[i.e., No. of working days × Hrs. of daily work × No. of workers

     = Labour hours worked.]

Problem 21.

    In a factory, the following particulars have been found for a three month period. Compute the departmental overhead rates for each of the production departments, assuming that overheads are recovered as a percentage of direct wages.

	Production Departments			*Service Departments*	
	A	*B*	*C*	*D*	*E*
Direct wages (Rs.)	2,000	3,000	4,000	1,000	2,000
Direct materials (Rs.)	1,000	2,000	2,000	1,500	1,500
No. of Staff	100	150	150	50	50
Electricity (kwh)	4,000	3,000	2,000	1,000	1,000
Light points (Nos.)	10	16	4	6	4
Assets value (Rs.)	60,000	40,000	30,000	10,000	10,000
Area occupied (sq. yds.)	150	250	50	50	50

The expenses for the period were :

Motive power	550
Lighting	100
Stores overheads	400
Amenities to staff	1,500
Depreciation	15,000
Repairs and maintenance	3,000
General overheads	6,000
Rent and taxes	275

    Expenses of the Service Department *E* are to be apportioned to Production Departments on the basis of Direct Wages and that of Service Department *D*, in the ratio of 5 : 3 : 2.

                                    (C. U., B. Com. Hons.—Adapted)

Solution :

Overhead Distribution Sheet

Period..............

Items of Expenses	Basis of Apportionment	Total Rs.	Production Departments A Rs.	Production Departments B Rs.	Production Departments C Rs.	Service Departments D Rs.	Service Departments E Rs.
Direct wages	Actual	3,000	—	—	—	1,000	2,000
Direct materials	Actual	3,000	—	—	—	1,500	1,500
Motive power	kwh	550	200	150	100	50	50
Lighting power	No. of points	100	25	40	10	15	10
Stores overheads	Direct materials	400	50	100	100	75	75
Amenities to staff	No. of staff	1,500	300	450	450	150	150
Depreciation	Assets value	15,000	6,000	4,000	3,000	1,000	1,000
Repairs & Maintenance	Assets value	3,000	1,200	800	600	200	200
General Overheads	Direct wages	6,000	1,000	1,500	2,000	500	1,000
Rent & Taxes	Area occupied	275	75	125	25	25	25
Total		32,825	8,850	7,165	6,285	4,515	6,010
Service Department E	Direct wages 5 : 3 : 2	—	1,336	2,003	2,671	—	—6,010
Service Department D		—	2,258	1,354	903	—4,515	—
Total		32,825	12,444	10,522	9,859	—	—
% of Overhead on Direct wages			$\frac{12,444}{2,000} \times 100$ 622·2%	$\frac{10,522}{3,000} \times 100$ 350·73%	$\frac{9,859}{4,000} \times 100$ 246·48%		

Problem 22.

The budget for a factory with three production departments (*A*, *B* and *C*), and two service departments (*X* and *Y*) is as follows for the year 1989.

Budget for year

Production departments	*A*	*B*	*C*
	Rs.	Rs.	Rs.
Direct wages	—	—	2,75,250
Overhead	2,00,000	2,11,900	95,000
Hours :			
Machine hours	2,06,000		
Labour hours	—	1,47,625	—

Service departments :	*X*	*Y*
	Rs.	Rs.
Overhead	1,16,000	95,000
Apportioned to production departments :	%	%
A	25	30
B	35	45
C	40	25

Record of operations for the month of June, 1989

Production department :

Hours :	Machine hours	*A*		18,000
	Labour hours	*B*		12,000
Wages :	Direct wages	*C*	Rs.	22,000
Total cost of overhead			Rs.	61,000

(a) Calculate the budgeted overhead rates for the production departments as follows :

    (i) Department *A* : machine hour rate ;

    (ii) Department *B* : direct labour hour rate ;

    (iii) Department *C* : percentage of direct wages.

(b) From the above information and the rates calculated, ascertain the amount of overhead under- or over-absorbed for the month of June.

Solution :

Budgeted overheads for the year 1989

	A	*B*	*C*
	Rs.	Rs.	Rs.
Production deptt. overheads	2,00,000	2,11,900	95,000
Service deptt. overheads :			
X (25 : 35 : 40)	29,000	40,600	46,400
Y (30 : 45 : 25)	28,500	42,750	23,750
	2,57,500	2,95,250	1,65,150

Overhead rates :

Deptt. A (machine hour rate) : $\dfrac{\text{Budgeted overhead}}{\text{Budgeted machine hrs.}}$

$= \dfrac{\text{Rs. } 2,57}{2,06,000} = \text{Rs. } 1 \cdot 25$ per machine hr.

Deptt. B (direct labour hour rate) : $\dfrac{\text{Budgeted overhead}}{\text{Budgeted labour hrs.}}$

$= \dfrac{\text{Rs. } 2,95,250}{1,47,625} = \text{Rs. } 2$ per direct labour hr.

Deptt. C (percentage of direct wages) : $\dfrac{\text{Budgeted overhead}}{\text{Budgeted direct wages}} \times 100$

$= \dfrac{\text{Rs. } 1,65,150}{2,75,250} \times 100 = 60\%$ of direct wages

		Rs.
(b) Overhead absorbed June, 1989 :		
Deptt. *A*—18,000 machine hrs. @ Rs. 1·25		22,500
B—12,000 labour hrs. @ Rs. 2·00		24,000
C—60% of Rs. 22,000 direct wages		13,200
		59,700
Overhead incurred June, 1989		61,000
Overhead under-absorbed		Rs. 1,300

Problem 23.

Silfox Manufacturing Company has made plans to produce 3,000 small mechanical units in the next twelve months. It has two service departments (Tool Room and General Services) and three production departments (Machining, Fitting, Painting and Packing). The following estimates have been made :

Material issues—Machining Rs. 2,40,000 ; Fitting Rs. 1,60,000 ; Painting and Packing Rs. 45,000 ; Tool Room Rs. 4,500.

Labour : Machining—11,000 hours at Rs. 1·70 per hour ; 9,000 hours at Rs. 1·60 per hour ; 2,500 hours at Rs. 1·40 per hour.

Fitting—6,600 hours at Rs. 1·60 per hour ; 4,476 hours at Rs. 1·50 per hour.

Painting and Packing—5,500 hours at Rs. 1·55 per hour ; 2,500 hours at Rs. 1·45 per hour.

Tool Room—Rs. 8,000. General Services Rs. 11,000.

Other Costs : Machining Rs. 90,050 ; Fitting Rs. 29,000 ; Painting and Packing Rs. 18,010 ; Tool Room Rs. 18,000 ; General Services Rs. 5,000.

The estimated percentage for services rendered are as follows :

Tool Room : Machining 50% ; Fitting 40% ; Painting and Packing 10% ;

General Services : Machining 40% ; Fitting 30% ; Painting and Packing 20% ; Tool Room 10%.

(a) Prepare a statement showing the overhead to be absorbed and recovered by the production departments.

(b) Calculate absorption rates using the following basis :

    (i) direct labour hour for machining ;

    (ii) percentage on direct wages for fitting ;

    (iii) rate per unit of production for painting and packing.

Solution :

(a) Overhead Distribution Summary

Period......

	Production Departments			Service Departments	
	Machining Rs.	Fitting Rs.	Painting and Packing Rs.	Tool Room Rs.	General Services Rs.
Materials	—	—	—	4,500	—
Labour	—	—	—	8,000	11,000
Other costs	90,050	29,000	18,010	18,000	5,000
	90,050	29,000	18,010	30,500	16,000
Redistribution of Service deptt. costs :					
General Services (40:30:20:10)	6,400	4,800	3,200	1,600	(16,000)
Tool Room (50 : 40 : 10)	16,050	12,840	3,210	(32,100)	—
Production Overhead	1,12,500	46,640	24,420	—	—

(b) *Absorption rates :*

    (i) Machining Deptt. (on the basis of direct labour hours)

$$\frac{\text{Overhead}}{\text{Direct hrs.}^1} = \frac{\text{Rs. } 1,12,500}{22,500} = \text{Rs. } 5 \text{ per direct labour hour}$$

Note : ¹Direct labour hrs. =11,000+9,000+2,500=22,500.

    (ii) Fitting Deptt. (on the basis of percentage on direct wages)

$$\frac{\text{Overhead}}{\text{Direct wages}^1} \times 100 = \frac{\text{Rs. } 46,640}{\text{Rs. } 17,274} \times 100 = 270\% \text{ of direct wages)}$$

Note : ¹Direct wages :

	Rs.
6,400 hrs. at Rs. 1·60 per hr.	10,560
4,476 hrs. at Rs. 1·50 per hr.	6,714
Total direct wages	17,274

    (iii) Painting and Packing Deptt. (on the basis of units of production)

$$\frac{\text{Overhead}}{\text{Production units}} = \frac{\text{Rs. } 24,420}{3,000} = \text{Rs. } 8·14 \text{ per unit}$$

Problem 24.

A manufacturing company produces various articles. The amount of overhead expenses incurred by the different departments are stated below :

	Amount of expenses Rs.	Amount of Dir. ct labour Rs.	No. of Hours worked	Floor space sq.ft.	Power consumed K.W.
Service Departments					
Maintenance	9,600				
Building service	12,000		1,000		
Power	4,000		400	2,000	
Production Departments					
Cutting	16,000	14,660	1,600	4,000	3,60,000
Assembly	8,000	13,520	1,800	8,000	40,000

The service department costs are distributed to other service departments and to the production departments in the order shown above. The basis of distribution of costs is as follows :

Overhead expenses of---	Basis of distribution
Maintenance deptt.	Hours worked in other departments
Building service deptt.	Floor space
Power deptt.	Power consumption

Draw up a statement of apportionment of overhead expenses and work out the percentage of overhead expenses on direct labour, separately in respect of Cutting and Assembly shops.   (*C. U., B. Com. Hons.*)

Solution :

Overhead Distribution Summary

Period.............

Basis of Redistribution	Mainte-nance Rs.	Building Service Rs.	Power Rs.	Cutting Rs.	Assembly Rs.
	Service Deptts.			**Production Deptts.**	
Total overheads	9,600	12,000	4,000	16,000	8,000
Hours worked	(−)9,600	2,000	800	3,200	3,600
Floor space occupied		(−)14,000	2,000	4,000	8,000
Power consumed			(−)6,800	6,120	680
				29,320	20,280

Percentage of overhead expenses on Direct Labour :

Cutting Deptt. : $\dfrac{29,320}{14,660} \times 100 = 200\%$

Assembly Deptt. : $\dfrac{20,280}{13,520} \times 100 = 150\%$

Problem 25.

The Belsam Company has two production departments, viz., Machinery and Finishing, and two service departments, viz., Maintenance and Materials Handling.

The overhead budgets per four week period are Rs. 9,000 for the Machinery Department, and Rs. 7,500 for the Finishing Department. The Machinery Department overhead is absorbed on a machine hour basis (300 per period) and Finishing Department overhead is absorbed on the basis of direct labour hours (3,000 per period).

In establishing the overhead budgets of the production departments, service department costs have been dealt with as follows :

Maintenance Deptt. :   60% to Machining Deptt.,

                            30% to Finishing Deptt., and

                            10% to Materials Handling.

Materials Handling :   30% to Machining Deptt.,

                            50% to Finishing Deptt., and

                            20% to Maintenance Deptt.

During period 5, the Machining Department was in operation for 292 hours and the number of direct labour hours worked by Finishing department personnel was 3,100. Overhead incurred during period 5 was as follows :

	Machining	Finishing	Maintenance	Materials Handling
	Rs.	Rs.	Rs.	Rs.
Materials	2,000	3,000	1,000	200
Labour	3,000	900	2,000	3,000
Other allocated costs	600	400	800	300

You are required to :

(a) write up the overhead accounts for each of the production departments for period 5 showing the disposition of any under/over absorption,

(b) state the factors which give rise to the under/over absorption, and

(c) analyse the under/over absorption under the headings you have stated in your answer to (b)

Solution :

Overhead Distribution Sheet (*Repeated distribution Method*)

	Production Deptts.		Service Deptts.	
	Machining	Finishing	Maintenance	Materials Handling
	Rs.	Rs.	Rs.	Rs.
Materials	2.000	3.000	1.000	200
Labour	3.000	900	2 000	3.000
Other allocated costs	600	400	800	300
	5 600	4.300	3,800	3.500
Re-distribution of service deptt. costs				
Maintenance (60 : 30 : 10)	2.280	1.140	(3.800)	380
Materials handling (30 : 50 : 20)	1.164	1.940	776	(3,880)
Maintenance (same as above)	466	233	(776)	77
Materials handling (same as above)	23	39	15	(77)
Maintenance (same as above)	10	5	(15)	
Production overheads incurred	9,543	7,657	—	—

Predetermined overhead absorption rates

$$= \frac{\text{Budgeted overhead}}{\text{Budgeted absorption base}}$$

Machining Deptt. $= \dfrac{\text{Rs. } 9,000}{300 \text{ machine hrs.}} = \text{Rs. } 30$ per machine hr.

Finishing D. ptt. $= \dfrac{\text{Rs. } 7,500}{3,000 \text{ labour hrs.}} = \text{Rs. } 2{\cdot}50$ per direct labour hr.

Overhead absorbed during period 5

Machining Deptt. 292 machine hrs. @ Rs. 30 = Rs. 8,760

Finishing Deptt. 3,100 labour hrs. @ Rs. 2·50 = Rs. 7,750

(a) *Overhead accounts*

Overhead Account (Machining Deptt.)

	Rs.		Rs.
To Overheads incurred as per distribution sheet	9,543	By W.I.P.—overheads absorbed ., Profit & Loss A'c—under absorption	8,760 783
	9,543		9,543

Overhead Account (Finishing Deptt.)

	Rs.		Rs.
To Overheads incurred as per distribution sheet	7,657	By W.I.P.—Overheads absorbed	7,750
,, Profit & Loss A/c —over-absorption	93		
	7,750		7,750

(b) *Factors giving rise to under/over absorption are mentioned below :*

(i) Actual expenditure being greater/less than budgeted expenditure :

(ii) Actual activity being greater/less than budgeted activity.

(c) *Analysis of under/over absorption :*

	Budget	Actual	under (u) or over absorption (o)	
Machining Deptt.				
Expenditure	Rs. 9,000	Rs. 9,543		Rs. 543 (u)
Activity	300 hrs.	292 hrs.	(8 hrs. × Rs. 30)	Rs. 240 (u)
				Rs. 783 (u)
Finishing Deptt.				
Expenditure	Rs. 7,500	Rs. 7,657		Rs. 157 (u)
Activity	3,000 hrs.	3,100 hrs.	(100 hrs. × Rs. 2·50)	Rs. 250 (o)
				Rs. 93 (o)

Problem 26.

A company with three production departments and two service departments has the following balances on a departmental distribution summary of expenses :

Production Departments		*Service Departments*	
Manufacturing	Rs. 48,000	Power	Rs. 6,000
Assembly	Rs. 42,000	Administration	Rs. 10,000
Finishing	Rs. 36,000		

The expenses of the Service Departments are charged out on the following basis :

Service Department	*Production Departments*			*Service Departments*	
	Manufac-turing	Assembly	Finishing	Power	Administration
Power	40%	25%	15%	—	20%
Administration	35%	30%	20%	15%	—

You are required to show the apportionment of service departments expenses to the production departments by an appropriate method

Solution :

Under Repeated or Continuous Distribution Method

Secondary Overhead Distribution Sheet

Period...............

	Production Deptts.			Service Deptts.	
	Manu-facturing	Assembly	Finishing	Power	Adminis-tration
	Rs.	Rs.	Rs.	Rs.	Rs.
Balance per departmental distribution summary	48,000	42,000	36,000	6,000	10,000
Power costs	2,400	1,500	900	−6,000	1,200
Administration Department	3,920	3,360	2,240	1,680	−11,200
Power Department	672	420	252	−1,680	336
Administration Department	118	101	67	50	−336
Power Department	20	12	8	−50	10
Administration Department	4	4	2	—	−10
Total	55,134	47,397	39,469		

Under Simultaneous Equation Method

Let a be the total cost of Power Department after receiving 15% of Administration Department's cost ; and b be the total costs of Administration Department after receiving 20% of Power Department's costs.

Then $a = 6,000 + \frac{15}{100} b$ (i)

$b = 10,000 + \frac{20}{100} a$ (ii)

or. $b = 10,000 + \frac{20}{100} (6,000 + \frac{15}{100} b)$,

[substituting the value of a in eq. (ii)]

or, $b = 10,000 + 1,200 + \frac{3}{100} b$

or, $100 b = 10,00,000 + 1,20,000 + 3b$, [multiplying both the sides by 100]

or, $100 b = 11,20,000 + 3b$

or, $97 b = 11,20,000$

∴ $b = 11,546$ (approx.)

$a = 6,000 + \frac{15}{100} \times 11,546$ [Putting the value of b in eq. (i)]

$= 7,732$ (approx.)

	Production Deptts.			Service Deptts.	
	Manu-facturing	Assembly	Finishing	Power	Adminis-tration
	Rs.	Rs.	Rs.	Rs.	Rs.
Balance per departmental distribution summary	48,000	42,000	36,000	6,000	10,000
Power Department	3,093	1,933	1 160	−7,732	1,546
Administration Department	4,041	3,464	2,309	1,732	−11,546
Total	55,134	47,397	39,469	—	—

Problem 27.

Chasem Ltd. is a manufacturing company having three production departments A, B and C and two service departments X and Y. The following is the budget for December, 1990 :

	Total Rs.	A Rs.	B Rs.	C Rs.	X Rs.	Y Rs.
Direct material		3,000	6,000	12,000	6,000	3,000
Direct wages		15,000	6,000	24,000	3,000	6,000
Factory rent	12,000					
Power	7,500					
Depreciation	3,000					
Other Overheads	27,000					

Additional information :

Area (sq. ft)		500	250	500	250	500
Capital value of assets (Rs. in lac)		20	40	20	10	10
Machine hours (No.)		1,000	2,000	4,000	1,000	1,000
Horse power of machines		50	40	20	15	25

A technical assessment for the apportionment of expenses of service departments is as under :

	A	B	C	X	Y
	%	%	%	%	%
Service Deptt. X	45	15	30	—	10
Service Deptt. Y	60	35	—	5	—

Required : (*i*) A statement showing distribution of overheads to various departments ; (*ii*) A statement showing redistribution of service departments expenses to production departments ; (*iii*) Machine hour rates of the production departments A, B and C.

Solution :

(i) Overhead Distribution Sheet

(Period : Dec. '90)

Items of expenses	Basis of apportionment	Total	Production Deptts.			Service Deptts	
			A	B	C	X	Y
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Direct materials	Direct	9,000	–	–	–	6,000	3,000
Direct wages	Direct	9,000	–	–	–	3,000	6,000
Factory rent	Area (sq. ft.)	12,000	3,000	1,500	3,000	1,500	3,000
Power	HP × Machine hrs.	7,500	1,500	2,400	2,400	450	750
Depreciation	Capital value	3,000	600	1,200	600	300	300
Other overheads	Machine hrs.	27,000	3,000	6,000	12,000	3,000	3,000
Total			8,100	11,100	18,000	14,250	16,050
		67,500					

(ii) Overhead Redistribution Sheet

	A	B	C	X	Y
	Rs.	Rs.	Rs.	Rs.	Rs.
Total per distribution summary	8,100	11,100	18,000	14,250	16,050
Department X	6,412	2,138	4,275	− 14,250	1,425
Department Y	10,485	6,116	—	874	− 17,475
Department X	393	131	262	− 874	88
Department Y	53	31	–	4	− 88
Department X	2	1	1	− 4	—
Total	25,445	19,517	22,538	—	—

(iii) Machine Hour Rates

$$\text{Deptt. } A \quad \frac{\text{Rs. } 25,445}{1,000} = \text{Rs. } 25 \cdot 45$$

$$B \quad \frac{\text{Rs. } 19,517}{2,000} = \text{Rs. } 9 \cdot 76$$

$$C \quad \frac{\text{Rs. } 22,538}{4,000} = \text{Rs. } 5 \cdot 63$$

Problem 28.

A company has three production departments *A, B, C* and two service departments *D* and *E*. The following figures are extracted from the records of the company :

	Rs.
Rent and rates	5,000
General lighting	600
Indirect wages	1,500
Power	1,500
Depreciation of machinery	10,000
Sundries	10,000

The following further details are available :

	A	*B*	*C*	*D*	*E*
Floor Space (sq. ft.)	2,000	2,500	3,000	2,000	500
Light Points	10	15	20	10	5
Direct wages (Rs.)	3,000	2,000	3,000	1,500	500
H. P. of machines	60	30	50	10	—
Value of Machinery (Rs.)	60,000	80,000	1,00,000	5,000	5,000
Working Hours	6,226	4,028	4,066	—	—

The expenses of *D* and *E* are allocated as follows :

	A	*B*	*C*	*D*	*E*
D	20%	30%	40%	--	10%
E	40%	20%	30%	10%	

What is the total cost of an article if its raw material cost is Rs. 50, labour cost is Rs. 30 and it passes through Departments *A, B* and *C* for 4, 5 and 3 hours respectively ?

Solution :

<div align="center">

Overhead Distribution Sheet   *Period ....*

</div>

Items of expenses	Basis of apportionment	Total	Production Deptts.			Service Deptts.	
			A	*B*	*C*	*D*	*E*
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Rent and rates	Floor space	5,000	1,000	1,250	1,500	1,000	250
General lighting	Light points	600	100	150	200	100	50
Indirect wages	Direct wages	1,500	450	300	450	225	75
Power	HP of machines	1,500	600	300	500	100	--
Depreciation of machinery	Value of machinery	10,000	2,400	3,200	4,000	200	200
Sundries	Direct wages	10,000	3,000	2,000	3,000	1,500	500
Direct wages	Direct	2,000	—	—	—	1,500	500
		30,600	7,550	7,200	9,650	4,625	1,575
Service Deptt. *D*			925	1,388	1,850	− 4,625	462
Service Deptt. *E*			815	407	611	204	−2,037
Service Deptt. *D*			41	61	82	− 204	20
Service Deptt. *E*			8	5	7	—	−20
Total		30,600	9,339	9,061	12,200	—	—
Working Hours			6,226	4,028	4,066		
Overheads per hour	Rs.		1·50	2·25	3·00		

Statement showing cost of the article

		Rs.
Raw materials		50·00
Labour		30·00
Overheads :		
Deptt. *A* 4 × Rs. 1·50	6·00	
B 5 × Rs. 2·25	11·25	
C 3 × Rs. 3·00	9·00	
		26·25
		106·25

Problem 29.

Find out the cost of each unit of service produced by each of the service departments from the following data for 1990 :

Service Departments	Steam	Water	Power
Production	18,000 MT	7,00,000 CM	30,00,000 kwh
Expenses	Rs.	Rs.	Rs.
Direct Materials	2,50,000	2,00,000	50,000
Direct Labour	1,00,000	1,90,000	1,50,000
Direct Expenses	1,60,000	1,24,000	1,20,000
Overheads	1,74,240	1,58,000	2,72,000
Steam	—		10,000 MT
Water	56,000 CM	—	1,05,000 CM
Power	1,46,400 kwh	4,20,000 kwh	80,000 kwh

(*I. C. W. A. Inter.—Adapted*)

Solution :

	Steam	Water	Power
	Rs.	Rs.	Rs.
Direct Material	2,50,000	2,00,000	50,000
Direct Labour	1,00,000	1,90,000	1,50,000
Direct Expenses	1,60,000	1,24,000	1,20,000
Overheads	1,74,240	1,58,000	2,72,000
Total cost excluding inter-departmental Services	6,84,240	6,72,000	5,92,000
Production	18,000 MT	7,00,000 CM	30,00,000 kwh
Per unit cost of production (say)	x	y	z
Total cost	18,000 x	7,00,000y	30,00,000 z
Cost of services rendered to Service Deptts. :			
Steam	—	—	10,000 x
Water	56,000 y	—	1,05,000 y
Power	1,46,400 z	4,20,000z	80,000 z

Now we have the following equations :

$$18,000 \ x = 6,84,240 + 56,000 \ y + 1,46,400 \ z \qquad \dots \qquad \dots \qquad \text{(i)}$$

$$7,00,000 \ y = 6,72,000 + 4,20,000 \ z \qquad \dots \qquad \dots \qquad \text{(ii)}$$

$$30,00,000 \ z = 5,92,000 + 10,000 \ x + 1,05,000 \ y + 80,000 \ z \qquad \dots \qquad \text{(iii)}$$

From equation (ii) we get,

$$y = \frac{6,72,000 + 4,20,000 \ z}{7,00,000} = 0.96 + 0.6 \ z \qquad \dots \qquad \text{(iv)}$$

Substituting the value of y in equation (i) we get,

$$18,000 \ x = 6,84,240 + 56,000 \ (0.96 + 0.6z) + 1,46,400 \ z$$

or, $18,000 \ x = 6,84,240 + 53,760 + 33,600 \ z + 1,46,400 \ z$

or, $18,000 \ x = 7,38,000 + 1,80,000 \ z$

$$\therefore \ x = \frac{7,38,000 + 1,80,000 \ z}{18,000} = 41 + 10 \ z \qquad \dots \qquad \text{(v)}$$

Substituting the values of x and y in equation (iii) we get,

$$30,00,000 \ z = 5,92,000 + 10,000 \ (41 + 10 \ z) + 1,05,000 \ (0.96 + 0.6z) + 80,000 \ z$$

or, $30,00,000 \ z = 5,92,000 + 4,10,000 + 1,00,000 \ z + 1,00,800 + 63,000z + 80,000 \ z$

or, $27,57,000 \ z = 11,02,800$

$$\therefore \ z = 0.4 \qquad \dots \qquad \text{(vi)}$$

Now, substituting the value of z in (v) and (iv) we get—

$$x = 41 + 10 \times 0.4 = 45$$

$$y = 0.96 + 0.6 \times 0.4 = 1.20$$

So per unit cost of production is :

Steam (i.e., x)	Rs. 45 per MT
Water (i.e., y)	Rs. 1·20 per CM
Power (i.e., z)	Rs. 0·40 per kwh

Problem 30.

A machine was purchased on January 1, 1982 for Rs. 5 lac. The total cost of all machinery inclusive of the new machine was Rs. 75 lac. The following further particulars are available :

Expected life of the machine	10 years
Scrap value at the end of ten years	Rs. 5,000
Repairs and maintenance for the machine during the period of ten years	Rs. 20,000
Expected number of working hours of the machine per year	4,000 hrs.
Insurance premium annually for all machinery	Rs. 4,500
Electricity consumption for the machine per hour (@ 75 p. per unit)	25 units

Area occupied by the machine	100 sq. ft.
Area occupied by other machines	1,500 sq. ft.
Rent per month for the Department	Rs. 800
Lighting charges for twenty points for the whole	

Department out of which three are for the machine, Rs. 120 per month.

Compute the machine-hour-rate for the new machine on the basis of the above noted data. *(C. U., B. Com. Hons.)*

Solution :

Computation of Machine Hour Rate

	Per year Rs.	Per hour Rs.
Fixed Expenses :		
Insurance premium (apportioned on capital value basis) $\frac{6}{75} \times$ Rs. 4,500 ...	300	
Rent (apportioned on area basis) $\frac{100}{1,500 + 100} \times$ Rs. 800 × 12 ...	600	
Lighting (apportioned on points basis) $\frac{3}{20} \times$ Rs. 120 × 12 ..	216	
For 4,000 hours ...	1,116	0·279
Variable Expenses :		
Depreciation $\frac{\text{Rs. (5,00,000} - 5,000)}{10 \times 4,000}$ ...		12·375
Repairs and maintenance $\frac{\text{Rs. 20,000}}{10 \times 4,000}$ ...		0·500
Electricity for machine 25 × Re. 0·75 ..		18·750
Overhead rate per machine hour ...		31·904

Problem 31.

Compute machine hour rate of a machine in a shop consisting of 3 machines occupying equal floor space. Following details are supplied for the machine of which estimated working hours per year are fixed at 2,500 hours in which normal idle time is estimated at 20% of the standard time.

	Rs.
Rent and Taxes of the shop per annum	3,600
General Electricity for the shop per month	200
Repairs and Maintenance Expenses for the machine per annum	600
Rate of power charges for 100 units	3
(the machine consuming 10 units per hour)	
Foreman's Salary for supervising all the machines, per month	750

Indirect Labour cost Rs. 2 per hour for the machine.

The Machine costs Rs. 1,30,000 and scrap value is estimated at Rs. 10,000 and estimated life is 10 years.

The Foreman devotes equal attention for each machine in the shop.

(C. U., B. Com. Hons. '81)

Solution :

Computation of Machine Hour Rate

	Per year Rs.	Per hour Rs.
Fixed Expenses :		
Rent and taxes (apportioned on area basis) $\frac{1}{3}\times$Rs. 3,600 ...	1,200	
General electricity (apportioned on area basis)		
$\frac{1}{3}\times$Rs. 200×12	800	
Foreman's salary $\frac{1}{3}\times$Rs. 750×12	3,000	
For 2,000 hours	5,000	2·50
Variable Expenses :		
Depreciation $\dfrac{\text{Rs. }(1,30,000-10,000)}{10\times2,000}$		6·00
Repairs and maintenance $\dfrac{\text{Rs. }600}{2,000}$		0·30
Power $\frac{10}{100}\times$Rs. 3		0·30
Indirect labour		2·00
Overhead rate per machine hour		11·10

Working Note :

Effective working hours of the machine : 2,500 − 20 % of 2,500 = 2,000.

Problem 32.

From the following particulars calculate the machine hour rate :

Cost of the machine	Rs. 2,00,000
Installation charges	Rs. 20,000
Rent of the shop per month	Rs. 3,000
Insurance Premium for the machine per annum	1% of capital cost
Electricity charges for the shop per month	Rs. 300
Repair and Maintenance per month	0·5% of capital cost
Supervisor's Salary per month	Rs. 1,800
Rate of power charges for 100 units	Rs. 55

(The machine consumes 16 units of power per hour)

The machine occupies $\frac{1}{3}$rd of the shop area. Its life is 10 years and anticipated scrap value is Rs. 10,000. The supervisor devotes $\frac{1}{4}$th of his time to the machine.

Estimated Idle Time : 50 hours in a year.

Normal working days during a year :

250 days of 8 hours.

50 days of 5 hours. (*C. U., B. Com. Hons. '87*)

Solution

Computation of Machine Hour Rate

	Per year	Per hour
	Rs.	Rs.
Fixed Expenses :		
Rent $\frac{1}{3}$ × Rs. 3,000 × 12	12,000	
Insurance $\frac{1}{100}$ × Rs. (2,00,000 + 20,000)	2,200	
Electricity charges $\frac{1}{3}$ × Rs. 300 × 12	1,200	
Repairs and maintenance $\frac{0.5}{100}$ × Rs. 2,20,000 × 12	13,200	
Supervisor's salary $\frac{1}{4}$ × Rs. 1,800 × 12	5,400	
For 2,200 hours	34,000	15·45
Variable Expenses :		
Depreciation Rs. $\dfrac{(2,00,000 + 20,000 - 10,000)}{10 \times 2,200}$		9·55
Powers $\frac{16}{100}$ × Rs. 55		8·80
Overhead rate per machine hour		33·80

Working Note :

Effective working hours of the machine :	Hrs.
250 days of 8 hours	2,000
50 days of 5 hours	250
	2,250
Less . Idle time	50
	2,200

Problem 33.

The following annual charges are incurred in respect of a machine in a shop where manual labour is almost nil and where work is done by means of five machines of exactly similar type and specification :

	Rs.
1. Rent and Rates (proportional to the floor space occupied) for the shop	4,800
2. Depreciation on each machine	500
3. Repairs and maintenance for the five machines	1,000
4. Power consumed (as per meter) @ 5 paise per unit for the shop	3,000
5. Electric charges for lights in the shop	540
6. Attendants : There are two attendants for the five machines and they are paid Rs. 60 p.m. each.	
7. Supervision : For the five machines in the shop there is one supervisor whose emoluments are Rs. 250 p.m.	
8. Sundry supplies such as lubricants, jute and cotton waste etc. for the shop	450
9. Hire purchase instalment payable for the machine (including Rs. 300 as interest)	1,200

The machine uses 10 units of power per hour.

Calculate the machine hour rate for the machine for the year.

Solution :

Computation of Machine Hour Rate

	Per year Rs.	Per hour Rs.
Fixed Expenses :		
Rent and Rates $\frac{1}{5}$ × Rs. 4,800 ...	960	
Lighting $\frac{1}{5}$ × Rs. 540 ...	108	
Attendants' salary $\frac{1}{5}$ × Rs. 60 × 12 × 2 ...	288	
Supervisor's salary $\frac{1}{5}$ × Rs. 250 × 12 ...	600	
Sundry Supplies $\frac{1}{5}$ × Rs. 450 ...	90	
For 1,200 hours ...	2,046	1·71
Variable Expenses :		
Depreciation $\frac{Rs.\ 500}{1,200}$ ...		0·42
Repairs and maintenance $\frac{Rs.\ 1,000}{5 \times 1,200}$ ...		0·17
Power 10 × Re. 0·05 ...		0·50
Overhead rate per machine hour ...		2·80

Working Notes :

1. Working hours of the machine during the year—

   Power consumed by the shop in units $\frac{3,000}{0·05}$ = 60,000

   Power consumed by the machine in units $\frac{1}{5}$ × 60,000 = 12,000

   Working hours of the machine @ 10 units per hour $\frac{12,000}{10}$ = 1,200 hours.

2. Hire purchase instalments will not come at all in the computation of machine hour rate. Interest on instalments has also been excluded on the consideration that it is purely a financial charge not to enter into cost.

Problem 34.

A machine costs Rs. 90,000 and is deemed to have a scrap value of 5% at the end of its effective life (9 years). Ordinarily the machine is expected to run for 2,400 hours per annum, but it is estimated that 150 hours will be lost for normal repairs and maintenance and further 750 hours will be lost due to normal staggering. The other details in respect of the machine shop are :

(a) Wages, bonus and Employer's P.F. contribution
of each of two operators (each operator is in
charge of two machines)   Rs. 6,000 per year

(b) Rent and rates of the shop   Rs. 3,000 per year

(c) General Lighting of the shop   Rs. 250 per month

(d) Insurance premium for the machine   Rs. 200 per quarter

(e) Cost of repairs and maintenance per machine   Rs. 250 per month

(f) Shop supervisor's salary   Rs. 500 per month

(g) Power consumption of the machine per hour—
20 units, rate of power per 100 units being Rs 10.

(h) Other factory overhead attributable to the shop Rs. 4,000 per year

There are four identical machines in the shop. The supervisor is expected to devote one-fifth of his time for supervising the machine. Compute a comprehensive machine hour rate from the above details.

Solution :

Computation of Machine Hour Rate

	Per year Rs.	Per hour Rs.
Fixed Expenses :		
Rent and rates (apportioned on area basis) $\frac{1}{4} \times$ Rs. 3,000 ...	750	
General lighting (apportioned on area basis) $\frac{1}{4} \times$ Rs. 250 $\times$ 12 ...	750	
Insurance Rs. 200 $\times$ 4	800	
Supervisor's salary $\frac{1}{5} \times$ Rs. 500 $\times$ 12 ...	1,200	
Other factory overheads $\frac{1}{4} \times$ Rs. 4,000 ...	1,000	
Wages etc. of operators Rs. 6,000 $\div$ 2 ...	3,000	
For 1,500 hours ...	7,500	5·00
Variable Expenses :		
Repairs and maintenance $\dfrac{\text{Rs. } 250 \times 12}{1,500}$ ...		2·00
Depreciation $\dfrac{\text{Rs. } (90,000-4,500)}{19 \times 1,500}$ ...		3·00
Power $\frac{10}{100} \times$ Rs. 10 ..		2·00
Overhead rate per machine hour ...		12·00

Working Note :
Effective working hours $(2,400-150-750)=1,500$ hours.

Problem 35.

From details furnished below you are required to compute a comprehensive Machine hour rate :

(i)	Original purchase price of the machine (subject to depreciation at 10 per cent per annum on original cost)	Rs. 21,600
(ii)	Normal working hours for the month (the machine works only 75% of capacity)	200 hours
(iii)	Wages of Machineman	Rs. 4 per day (of 8 hours)
(iv)	Wages of a helper (machine attendant)	Rs. 2 per day (of 8 hours)
(v)	Power consumption (H. P.) estimated at Rs. 150 per mensem for the time worked	
(vi)	Supervision charges apportioned to the machine centre	Rs. 300 p.m.
(vii)	Electricity and lighting	Rs. 75 p.m.
(viii)	Repairs and maintenance (machine) including consumable stores per mensem	Rs. 150
(ix)	Insurance of Plant and Building (apportioned) per annum	Rs. 1,000
(x)	Other general expenses (overhead) per annum	Rs. 2,160
(xi)	Production bonus payable to workers in terms of an award of basic wages and dearness allowance	33⅓%

(xii) Workers are also paid a fixed dearness allowance of Rs. 75 p.m.

(xiii) Add 10% of the basic wages and dearness allowance against leave wages and holiday with pay to arrive at a comprehensive labour cost for debit to production.

(*C. U., B. Com. Hons.*)

Solution

Computation of Machine Hour Rate

	Per month	Per hour
	Rs.	Rs.
Fixed Expenses :		
Supervision	300·00	
Electricity and lighting	75·00	
Insurance $\frac{1}{12}$ × Rs. 1,000	83·33	
Other general expenses $\frac{1}{12}$ × Rs. 2,160	180·00	
Wages of machineman	250·83	
Wages of helper	179·17	
For 150 hours	1,068·33	7·12
Variable Expenses :		
Depreciation $\frac{\text{Rs. 21,600}}{10 \times 150 \times 12}$		1·20
Repairs and maintenance		1·00
Power	...	1·00
Overhead rate per machine hour	..	10.32

Working Notes :

1. Effective working hours per month $\frac{75}{100}$ × 200 = 150 hours.

2. Wages of machineman and helper per hour :

		Machineman		Helper
		Rs.		Rs.
Wages for 200 hrs.	(4/8 × 200)	100·00	(2/8 × 200)	50·00
Dearness Allowance		75·00		75·00
		175·00		125·00
Production bonus : 33⅓% of Basic and D.A.		58·33		41·67
Leave wages : 10% of Basic and D.A.		17·50		12·50
Total per month		250·83		179·17

Problem 36.

Your company contemplates buying a heavy duty site-levelling machine which will be hired out at an hourly rate. Two similar machines, *A* and *B* with different cost patterns are being considered. You are given the following data :

Machine	*A*	*B*
Capital cost	Rs. 44,000	Rs. 36,600
Value estimated after one year	Rs. 8,000	Rs. 6,000
Estimated operating time next year	900 hrs.	900 hrs.
Costs expected to vary with operating time		
Fuel cost per hour	Rs. 6	Rs. 7
Servicing cost per quarter	Rs. 1,080	Rs. 1,620
Tyres per month	Rs. 540	Rs. 630

	A	B
Driver's remuneration per annum	Rs. 7,200	Rs. 7,200
Fixed costs for next year including Central		
Administration Expenses	Rs. 3,060	Rs. 3,060

You are required to calculate an hourly rate for each machine and to recommend which should be bought, allowing for a profit margin of 20% of the total cost in each case, and bearing in mind that the market is very competitive.

Solution :

Computation of hourly rate

	A Rs.	B Rs.
Fixed Expenses :		
Depeciation	36.000	30,600
Central Admin. Expenses	3,060	3,060
Driver's remuneration	7,200	7,200
Variable Expenses :		
Fuel	5,400	6,300
Servicing	4,320	6,480
Tyres	6,480	7,560
Total cost per annum	62,460	61,200
Add : Profit margin of 20 per cent	12,492	12,240
	74,952	73,440
Operating time	900 hrs.	900 hrs.
Hourly rate of hire charge	83·28	81·60

It would, therefore, be more profitable to buy machine *B*, because the annual cost is lower than that of *A*, so also the initial capital outlay.

Problem 37.

From the following data of a textile factory machine room, compute an hourly machine rate, assuming that the machine room will work on 90% capacity throughout the year and that a breakdown allowance of 10%, in addition, is reasonable.

There are 3 days' holiday at Deepawali, 2 days at Holi and 2 days at Christmas, exclusive of Sundays. The factory works 8 hours a day and 4 hours on Saturday. The year in question is not a leap year.

No. of machines (each of the same type)	40
Expenses :	Rupees per annum
Power	3,120·00
Light	640·00
Salaries to foremen	1,200·00
Lubricating oil	66·16
Repairs to machines	1,448·00
Depreciation	785·60
Total	7,259·76

Solution :

No. of days in a year		365
Less : Holidays (3+2+2)	7	
Sundays	52	
Saturdays (4 hours a day)	52	
		111
No. of full working days excluding 52 Saturdays		254

(It has been assumed that holidays do not fall on Sundays and Saturdays.)

No. of hours on full working days : 254×8	2,032·00
No. of hours on Saturdays 52×4	208·00
Total available working hours per machine	2,240·00
Working hours at 90% capacity $\frac{90}{100}$ ×2,240	2,016·00
Less : Allowance for breakdown @ 10%	201·60
Effective working hours per machine	1,814·40
Effective working hours for 40 machines	72,576·00
Total cost	Rs. 7,257·60

∴ Overhead rate per machine hour $\left(\dfrac{\text{Rs. } 7,257\cdot60}{72,576}\right)$ Re. 0·10

Problem 38.

A predetermined absorption rate is to be established for a particular machine for the year ending on 31st December, 1989.

(a) The machine was bought two years ago for Rs. 1,20,000 and cost Rs. 2,000 to install ; it has an estimated life of 8 years and an estimated residual value of Rs. 4,000. Depreciation is calculated using the straight line method.

(b) The maintenance costs during the year are expected to be Rs. 5,360 and it is thought wise to provide an amount of Rs. 1,500 for the possible use of reserve equipment. Insurance premium will amount to Rs. 600.

(c) Costs extracted from the machine shop budget are :   Rs.

Rent and rates	24,000
Electricity	9,000
Supervision	30,000
Consumable materials	6,000

(d) There are 240 working days during the year and the machine operators work 8 hours each day. Each machine requires the attention of a full-time operator who spends approximately 10 per cent of his time for cleaning and re-setting the machine. The rest of the time is spent on production.

(e) The labour rate will be Rs. 1·50 per hour and power costs are likely to be 8 paise per hour.

(f) The area in square feet is : Department 3,000
                                         Machine   250

(g) Supervision and consumable materials are to be apportioned on the basis of the number of hours the machine is engaged in production, the budget for the whole of the machine shop being 25,920 hours.

You are required to calculate an overhead absorption rate for the machine for the year ending on 31st December, 1989.

Solution :

Computation of Machine Hour Rate

		Rs.
Depreciation $\dfrac{\text{Rs. } 1,22,000 - \text{Rs. } 4,000}{8}$	...	14,750
Maintenance	...	5,360
Reserve equipment	...	1,500
Insurance premium	...	600
Rent and rates (apportioned on area basis) Rs. $24,000 \times \dfrac{250}{3,000}$	...	2,000
Electricity (apportioned on area basis) Rs. $9,000 \times \dfrac{250}{3,000}$	...	750
Supervision (apportioned on production hours basis) Rs. $30,000 \times \dfrac{1,728}{25,920}$	...	2,000
Consumable materials (apportioned on production hours basis) Rs. $6,000 \times \dfrac{1,728}{25,920}$	...	400
Labour cost during cleaning and resetting 192 hrs. @ 1·50 per hr.	...	288
Total for 1,728 production hours	...	27,648
Cost per hour $\dfrac{\text{Rs. } 27,648}{1,728}$	..	16·00
Add : Power cost per hour	...	0·08
Overhead rate per machine hour	...	16·08

Working Notes :

(1) No. of hours the machine is to be used on production
    $= 90\%$ of $(240 \times 8) = 1,728$ hours.

(2) No. of hours for cleaning and resetting $= 10 \;/\; $ of $(240 \times 8) = 192$ hours.

(3) It has been assumed that no power cost is incurred for cleaning and resetting.

(4) The labour cost per hour during hours of production should be omitted from the rate, assuming that the labour in question is of direct nature, but that for clearing and resetting represents overhead.

Problem 39.

Compute comprehensive machine hour rate from the following data :

(i) Total cost of one machine Rs. 2,30,000 ;
    Life 10 years ; Depreciation on straight line.

(ii) Departmental overheads (annual) :

Rent	Rs.	50,000
Heat and Light	Rs.	20,000
Supervision	Rs.	1,30,000

(iii) Departmental area 70,000 sq. ft.
    Machine area 2,500 sq. ft.

(iv) 26 machines in the department

(v) Annual cost of reserve equipment for all the machines Rs. 1,500

(vi) Hours run on production 1,800

(vii) Hours for setting and adjusting 200

(viii) Power cost Re. 0·50 per hour of running time

(ix) Labour (a) when setting and adjusting, full time attention

(b) when machine is producing, one man can look after 3 machines

(x) Labour rate Rs. 6 per hour.

Computation of Machine Hour Rate

		Rs.
Rent (apportioned on area basis) Rs. $50,000 \times \dfrac{2,500}{70,000}$	...	1,786
Heat and Light (apportioned on area basis) Rs. $20,000 \times \dfrac{2,500}{70,000}$	..	714
Supervision (apportioned on machine numbers basis) $\dfrac{\text{Rs. } 1,30,000}{26}$	...	5,000
Depreciation 10% of Rs. 2,30,000	...	23,000
Reserve equipment $\dfrac{\text{Rs. } 1,500}{26}$	...	58
Power cost during setting and adjustment $200 \times$ Re. 0·50	...	100
Labour cost during setting and adjustment $200 \times$ Rs. 6	.	1,200
Total for 1,800 production hours	...	31,858
Cost per hour $\dfrac{\text{Rs. } 31,858}{1,800}$		17·70
Add : Power		0·50
Labour $\frac{1}{3} \times$ Rs. 6		2·00
Overhead rate per machine hour (including labour)		

Problem 40.

The normal expenses attributable to Machine No. 25 and the normal hours for which the machine is expected to be utilized in the year, 1990, are indicated below :

Expenses :	Rs.	Rs.
Fixed		3,000
Variable—		
Power	2,500	
Repairs	1,000	
Lubricants	500	4,000
Total		7,000

Predetermind normal hours of working :

To make ready	*200 Hrs.
Running on Jobs	800 ,,
Total	1,000 Hrs.

From the data furnished below compute the cost of Job No. 5623 :

Materials consumed—	Rs.
10 units @ Rs. 4 per unit	40
Machine Labour—	
To make ready : 2 Hrs. @ Re. 1	2
Running on Job : 8 Hrs. @ Re. 1	8
	50

Note : Whenever a job is to be put on the machine, the machine is cleaned, any tools or jigs already on the machine are removed, and new tools etc., suitable for the particular job are fitted before commissioning the machine for the job and the time involved is to be charged to the job as 'Make Ready' time.

Solution :

Calculation of Machine Hour Rates—

Fixed expenses per hour : $\dfrac{\text{Total fixed expenses}}{\text{Total no. of hours}} = \dfrac{\text{Rs. } 3{,}000}{1{,}000} = \text{Rs. } 3$

Variable expenses per hour $\dfrac{\text{Total variable expenses}}{\text{Total no. of running hours}}$

$= \dfrac{\text{Rs. } 4{,}000}{800} = \text{Rs. } 5$

Machine hour rate during the period of 'made ready' : Rs. 3 per hour.
Machine hour rate during the period of actual production :

Rs. (3+5) or Rs. 8 per hour.

Cost Sheet for Job No. 5623

	Rs.	Rs.
Materials Consumed : 10 units @ Rs. 4 per unit ...		40·00
Machine Labour—	Rs.	
To make ready : 2 Hrs. @ Re. 1	2·00	
Running on Job : 8 Hrs. @ Re. 1	8·00	
		10·00
Prime Cost ...		50·00
Factory Expenses -		
To make ready : 2 Hrs. @ Rs. 3	6·00	
Running on Job : 8 Hrs. @ Rs. 8	64·00	
		70·00
Total Cost ...		120·00

Problem 41.

A machine shop has 6 identical machines manned by 5 operators. The machines cannot be worked without an operator wholly engaged on it. The original cost of all these 6 machines works out to Rs. 4 lakh.

The following particulars are for a 6 month period :

Normal available hours per month	210
Absenteeism (without pay)—hours p.m.	20
Leave (with pay)—hours p.m.	20
Normal idle time (unavoidable)—hours p.m.	10
Average rate of wages per day of 8 hours	Rs. 24
Production Bonus estimated	15% on wages
Value of power consumed	Rs. 10,350
Supervision and Indirect Labour	Rs. 4,000
Lighting and Electricity	Rs. 1,535

The following particulars are for a year :

Repairs and maintenance including consumables 2% on value of machines.

Insurance Rs. 30,000

Depreciation 15% on original cost

Other sundry works expenses Rs. 16,400

General management expenses allocated Rs. 54,500

You are required to work out a comprehensive machine hour rate for the Machine shop.

Solution :

Workings—

(1) *Effective hours of machine operation*

Normal available hours per month per operator 210

Less : Absenteeism hours 20

Leave hours 20

Idle time hours 10   50

Effective working hours per month per operator 160

Effective working hours for 5 operators for 6 months

$$= 160 \times 5 \times 6 = 4,800 \text{ hours.}$$

Since a machine cannot be worked without an operator wholly engaged on it, the machines can be used only for the hours for which operators are available. Hence 4,800 working hours for operators also represent effective machine hours for six months.

(2) *Operators' wages*

Hours per month for which wages are payable

$$= (210 \text{ hrs.} - 20 \text{ hrs.}) = 190 \text{ hrs.}$$

Average rate of wages per hour $= \dfrac{\text{Rs. } 24}{8} = \text{Rs. } 3$

Total wages for 5 operators for 6 months

$$= 190 \times 5 \times 6 \times \text{Rs. } 3 = \text{Rs. } 17,100.$$

Computation of Comprehensive Machine Hour Rate

		Rs.
Operators' wages	...	17,100
Production bonus (15% of wages)	...	2,565
Power consumed	...	10,350
Supervision and indirect labour	...	4,000
Lighting and electricity	...	1,535
Repairs and maintenance ($\frac{2}{100} \times \frac{6}{12} \times$ Rs. 4,00,000)	...	4,000
Insurance	...	15,000
Depreciation	...	30,000
Sundry works expenses	...	8,200
General management expenses	...	27,250
Total overheads of machine shop		1,20,000
Hours of machine operation	...	4,800
Comprehensive rate per machine hour	...	25·00

Problem 42.

Yapp Ltd., an engineering company, having 25 different types of automatic machines, furnishes you the following data for 1990-91 in respect of machine B :

1. Cost of the Machine	Rs. 50,000
Life 10 years	Scrap value is nil

2. Overhead Expenses are :   Rs.

Factory Rent	50,000 p.a.
Heating and Lighting	40,000 p.a.
Supervision	1,50,000 p.a.
Reserve Equipment for Machine B	5,000 p.a.
Area of the factory	80,000 sq. ft.
Area occupied by Machine B	3,000 sq. ft.

Power cost 50 paise per hour while in operation.

3. Wages of operator is Rs. 24 per day of 8 hours including all fringe benefits. He attends to one machine when it is under set up and two machines while under operation.

4. Estimated production hours	3,600 p.a.
Estimated set up time in hours	400 p.a.

Prepare a schedule of comprehensive machine hour rate and find the overhead chargeable to the following Jobs :

	Job 1203	Job 1502
Set up time (Hours)	80	40
Operation time (Hours)	130	160

Computation of Machine Hour Rate

		Rs.
Depreciation 10% of Rs. 50,000	...	5,000
Factory Rent (apportioned on area basis) $\frac{3.000}{80,000} \times$ Rs. 50,000	...	1,875
Heating and Lighting (apportioned on area basis) $\frac{3.000}{80.000} \times$ Rs. 40,000	...	1,500
Supervision (apportion on machine numbers basis) $\frac{Rs.\ 1.50.000}{25}$	...	6,000
Reserve equipment	...	5,000
Total	...	19.375
Estimated total hours	...	4,000
Cost per hour	...	4·84

		Set up	Operation
		Rs.	Rs.
Cost per hour as above	...	4·84	4·84
Add : Power	...	—	0·50
Operator's wages $\left(\frac{Rs.\ 24}{8}\right)$ and $\left(\frac{Rs.\ 24}{8} \times \frac{1}{2}\right)$ respectively	...	3·00	1·50
Comprehensive rate per machine hour	...	7·84	6·84

Statement showing overhead chargeable to the jobs

	Job 1203		Job 1502	
Set up	80 hrs. @ Rs. 7·84	627·20	40 hrs. @ Rs. 7·84	313·60
Operation	130 hrs. @ Rs. 6·84	889·20	160 hrs. @ Rs. 6·84	1,094·40
		1,516·40		1,408·00

Problem 43.

A manufacturing company uses two large identical and four small identical machines. Each large machine occupies one-quarter of the workshop and fully employs three workers ; each small machine occupies half the space of a large machine and fully employs two workers. The workers are paid by piece rate.

Each of the six machines is estimated to work 1,440 hours per year, while the effective working life is taken as 12,000 working hours for each large machine and 9,000 working hours for each small machine. Large machines cost Rs. 20,000 each and small machines cost Rs. 4,000 each. Scrap values are Rs. 4,000 and Rs. 100 respectively

Repairs, maintenance and oil are estimated to cost for each large machine Rs. 4,000, and each small machines Rs. 1,200, during its effective life.

Power consumption cost is 5 paise per unit and it amounts for a large machine to 20 units per hour and for a small machine to 2 units per hour.

The manager is paid Rs. 4,800 a year and workshop supervision occupies half of his time, which is divided equally among the six machines.

Details of other expenses are :

Rent and Rates of workshop	Rs. 6,400 a year
Lighting (to be apportioned in the ratio of workers employed)	Rs. 1,820 a year

Calculate the machine hour rate for a large machine and a small machine respectively.

Solution :

Workings—

(1) Rent and Rates (apportioned on the basis of space occupied) —

Each large machine : $\frac{1}{4} \times$ Rs. 6,400 = Rs. 1,600 p.a.

Each small machine : $\frac{1}{8} \times$ Rs. 6,400 = Rs. 800 p.a.

(2) Lighting (apportioned on the basis of workers employed)—

No. of workers : For 2 large machines @ 3 each = 6

For 4 small machines @ 2 each = 8

Total   14

Lighting for each large machine : $\frac{3}{14} \times$ Rs. 1,820 = Rs. 390 p.a.

Lighting for each small machine : $\frac{2}{14} \times$ Rs. 1,820 = Rs. 260 p.a.

(3)   Supervision (equally per machine)—

$\frac{1}{2} \times \frac{1}{6} \times$ Rs. 4,800 = Rs. 400 p.a.

(4)   Depreciation—

Large machine : $\dfrac{\text{Rs. } 20,000 - \text{Rs. } 4,000}{12,000}$ = Rs. 1·33 per hr.

Small machine : $\dfrac{\text{Rs. } 4,000 - \text{Rs. } 100}{9,000}$ = Re. 0·43 per hr.

(5)   Repairs and maintenance—
      Large machine :   Rs. 4,000 ÷ 12,000 = Re. 0·33 per hr.
      Small machine :   Rs. 1,200 ÷ 9,000 = Re. 0·13 per hr.

(6)   Power—
      Large machine : 20 units @ 5 p. = Re. 1·00 per hr.
      Small machine :   2 units @ 5 p. = Re. 0·10 per hr.

Computation of Machine Hour Rate

		Large Rs.	Small Rs.
Fixed Expenses :			
Rent and Rates	.	1,600	800
Lighting	.	390	260
Supervision	...	400	400
Total		2390	1460
Estimated working hrs. per year	.	1,440	1,440
Fixed Expenses per hr.	...	1·66	1·01
Variable Expenses :			
Depreciation	...	1·33	0·43
Repairs and maintenance	...	0·33	0·13
Power	...	1·00	0·10
Overhead rate per machine hour	...	4·32	1·67

Problem 44.

A factory normally operates for 50 weeks (of 48 hours each week) a year. 20% of *actual working* is normal idle time.

There are 300 employees in the whole factory and 51 in the machine shop consisting of 1 foreman (who is paid Rs. 200 per week) and 50 workmen. Machine No. 10 is run by 3 workmen, 2 of whom are paid Rs. 50 per week each and the other Rs. 30 per week. Besides, the employees get a puja bonus equal to 10 weeks' pay.

Horse power of all machinery in the machine shop is 150 and the horse power of machine No. 10 is 15.

The machine shop overheads are Rs. 50,000 p. a. (excluding the foreman's salary) and are to be apportioned on the basis of the number of workmen.

The administrative overheads of the entire factory are Rs. 80,000 p.a. and are to be apportioned on the basis of the number of employees.

The cost price of Machine No. 10 is Rs. 50,000. Its working life is estimated to be 24,000 hours after which its scrap value is estimated at Rs. 2,000. Estimated cost of repairs and upkeep of the machine is Rs. 1,200 per year.

The average power consumption of the Machine Shop is Rs. 1,200 per month of 4 weeks.

Calculate the machine hour rate for Machine No. 10.

Solution :

Workings—

(1) Effective working hours of Machine No. 10 per year :

$$50 \times 48 \times \tfrac{100}{120} = 2,000 \text{ hours.}$$

(2) Depreciation :

$$\frac{\text{Rs. } 50,000 - \text{Rs. } 2,000}{24,000} = \text{Rs. } 2 \text{ per effective working hour.}$$

(3) Remuneration[1] :

Foreman : (60 weeks' pay @ Rs. 200 per week apportioned on the basis of number of operators) $60 \times \text{Rs. } 200 \times \tfrac{3}{50} = \text{Rs. } 720$ p.a.

Workmen : $60 \times \text{Rs. } 50 \times 2$ = Rs. 6,000 p. a.

$60 \times \text{Rs. } 30 \times 1$ = Rs. 1,800 p. a.

= Rs. 7,800 p. a.

(4) Machine shop overheads (apportioned on the basis of number of workmen) : $\text{Rs. } 50,000 \times \tfrac{3}{50} = \text{Rs. } 3,000$ p. a.

(5) Administrative overhead (apportioned on the basis of number of employees) : $\text{Rs. } 80,000 \times \tfrac{51}{800} \times \tfrac{3}{50} = \text{Rs. } 816$ p.a.

(6) Power : $\tfrac{15}{150} \times \text{Rs. } 1,200 \times \tfrac{1}{4} \times \tfrac{1}{48} = \text{Re. } 0.63$ per hour. (approx.)

Computation of Machine Hour Rate

		Rs.
Foreman's salary	...	720
Workmen's wages	...	7,800
Machine shop overhead	...	3,000
Administrative overhead	...	816
Repairs and maintenance	...	1,200
Total for 2,000 production hours	...	13,536
Cost per hour $\frac{\text{Rs. } 13,536}{2,000}$	...	6·77
Add : Depreciation per hour	...	2·00
Power cost per hour	...	0·63
Overhead rate per machine hour	...	9·40

Note : 'Remuneration including bonus is paid for (50 + 10) or 60 weeks.

Cost (Part I)—22

Problem 45.

Zonak Ltd. can produce 10,000 units of a product per month when operating at 100% capacity. The following information is obtained from the records :

Month	pt. 1989	Oct. 1989
Units produced	8,800	7,300
Costs :	Rs.	Rs.
Production labour	6,160	5,110
Heating	3,900	3,900
Security salaries	88()	880
Repairs	6,480	5,580
Production material	51,040	42,340
Depreciation	7,640	7,640
Supervisors' salaries	6,880	5,980
Rent and rates	6,300	6,300
Lighting	2,336	2,006
General labour	3,696	3,066

The rate of production is 5 units per hour.

You are required to :

(a) compute the cost of production at 100%, 80% and 75% capacity, showing separately prime cost and the variable, semi-variable and fixed components of production overhead.

(b) show the overhead recovery rate per hour at 80% capacity.

Solution :

The first step is to classify the various cost items and determine their variable, semi-variable and fixed components.

Cost item	Change in cost (for variation of 1,500 units) Rs.	Cost classification	Cost components
Production labour	1,050	Variable	70p per unit
Heating	Nil	Fixed	
Security salaries	Nil	Fixed	
Repairs	900	Semi-variable	60p per unit +Rs. 1,200
Production material	8,700	Variable	Rs. 5·80 per unit
Depreciation	Nil	Fixed	
Supervisor's salary	900	Semi-variable	60p per unit +Rs. 1,600
Rent	Nil	Fixed	
Lighting	330	Semi-variable	22p per unit +Rs. 40C
General labour	630	Variable	42p per unit

Statement of Cost of Production

Capacity utilisation		100%		80%		75%
Output (units)		10,000		8,000		7,500
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Direct material		58,000		46,400		43,500
Direct labour		7,000		5,600		5,250
Prime cost		65,000		52,000		48,750

Production overhead
Variable

	Rs.	Rs.		Rs.		Rs.
General labour		4,200		3,360		3,150

Semi-variable

	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Repairs	7,200		6,000		5,700	
Supervisor's salary	7,600		6,400		6,100	
Lighting	2,600		2,160		2,050	
		17,400		14,560		13,850

Fixed

	Rs.	Rs.				
Heating	3,900					
Security salaries	880					
Depreciation	7,640					
Rent	6,300					
		18,720		18,720		18,720
Cost of production		Rs. 1,05,320		Rs. 88,640		Rs. 84,470
Cost per unit		Rs. 10·532		Rs. 11·08		Rs. 11·263

Overhead recovery rate at 80% capacity

$$= \frac{\text{Rs. } 36,640}{8,000} = \text{Rs. } 4\cdot58 \text{ per unit or}$$

$$\text{Rs. } 4\cdot58 \times 5 = \text{Rs. } 22\cdot90 \text{ per labour hour.}$$

Problem 46.

The Chief Accountant of your firm is unable to attend a Board meeting and you have been asked to deputise at the last moment. You are given some papers relating to the two main departments to be discussed at the meeting. These show the following information :

Department A		*Department B*	
Activity level in Direct Labour hours	Budget overhead allowance	Activity level in Machine hours	Budget overhead allowance
8,000	Rs. 26,550	16,000	Rs. 46,300
12,000	Rs. 36,150	40,000	Rs. 89,500
18,000	Rs. 50,550	56,000	Rs. 1,18,300

For Department *A*, the standard overhead rate is Rs. 3·10 per direct labour hour. For Department *B*, the standard activity level for calculating the standard overhead rate is 25,000 machine hours.

You are required to calculate :

(a) the fixed cost for Department *A* ;
(b) the standard activity level on which the standard overhead rate for Department *A* has been fixed ;
(c) the fixed cost for Department *B* ;
(d) the standard overhead rate per machine hour for Department *B*.

Solution :

Deptt. A

	Activity level (hours)	Budgeted overhead Rs.
	12,000	36,150
	8,000	26,550
Difference	4,000	9,600

Variable overhead per hour $= \dfrac{\text{Rs. } 9,600}{4,000} = \text{Rs. } 2\cdot40$

Budgeted overhead for 12,000 hrs.	Rs. 36,150
Less : Variable overhead for 12,000 hrs. @ Rs. 2·40	Rs. 28,800
Fixed overhead	Rs. 7,350

As standard overhead absorption rate is Rs. 3·10, the fixed portion is Rs. (3·10 - 2·40) or Re. 0·70.

∴ Standard activity level is $\dfrac{\text{Rs. } 7,350}{\text{Re. } 0\cdot70} = 10,500$ hrs.

Deptt. B

	Activity level (hours)	Budgeted overhead Rs.
	40,000	89,500
	16,000	46,300
Difference	24,000	43,200

Variable overhead per hour $= \dfrac{\text{Rs. } 43,200}{24,000} = \text{Rs. } 1\cdot80$

Budgeted overhead for 16,000 hrs.	Rs. 46,300
Less : Variable overhead for 16,000 hrs. @ Rs. 1·80	Rs. 28,800
∴ Fixed overhead	Rs. 17,500

The standard overhead absorption rate (on the basis of a standard activity level of 25,000 hours)

$= \dfrac{\text{Rs. } 17,500}{25,000} + \text{Rs. } 1\cdot80 = \text{Rs. } 2\cdot50$ per machine-hour.

Problem 47.

Shown below is the next year's budget for a small engineering factory manufacturing two different products in two production departments, namely, a machine shop and an assembly department. A canteen is also operated as a separate department.

You are required to (a) establish an appropriate overhead absorption rate for each production department and calculate the total budgeted cost per unit of each product. You must clearly state and briefly justify the methods of overhead absorption used : (b) assuming that the company operates a full absorption costing system, calculate the impact on budgeted profit, if in the next year, the actual results are as predicted except that sales and production of product *P* are 300 units higher than that as per budget.

Product	P	Q
Selling price per unit	Rs. 60	Rs. 70
Sales volume	1,500 units	3,000 units
Increase (decrease) in finished stocks	500 units	(500) units
Material cost per unit	Rs. 8	Rs. 5

Direct Labour :	*hrs. per unit*	*hrs. per unit*
Machine shop (Rs. 3 per hour)	5	6
Assembly department (Rs. 2 per hour)	4	4
Machining : Machine shop	3	8
Assembly department	1	—

	Machine shop	*Assembly department*	*Canteen*	*Total*
Production overhead :	Rs.	Rs.	Rs.	Rs.
Variable	26,000	9,000	---	35,000
Fixed	42,000	30,000	16,000	88,000
	68,000	39,000	16,000	1,23,000
Number of employees	15		1	
Floor area	4,000 sq. m.	1,000 sq. m.	1,000 sq. m.	

Solution

Calculation of Overhead Absorption Rates

	Machine shop	*Assembly deptt.*	*Canteen*	*Total*
	Rs.	Rs.	Rs.	Rs.
Allocated overhead	68,000	39,000	16,000	1,23,000
Apportionment of canteen expenses (number of employees)	10,000	6,000	(16,000)	—
Total overhead	78,000	45,000	–	1,23,000
Absorption base	Machine-hours	Labour hours		
Budgeted hours[1]	26,000	18,000		
Budgeted absorption rate	Rs. 3 per machine-hour	Rs. 2·50 per labour-hour		

Working Note :

'*Calculation of budgeted hours*

Product	*P*	*Q*
Budgeted production	2,000 units	2,500 units
Machine hrs. per unit	3	8
Total machine hrs.	6,000 hrs.	20.000 hrs.=26,000 hrs.
Labour hrs. per unit	4	4
Total labour hrs.	8,000 hrs.	10,000 hrs.=18,000 hrs.

Total budgeted cost per unit

Product		*P*		*Q*
		Rs.		Rs
Materials		8		5
Labour : Machine shop	15		18	
Assembly deptt.	8		8	
		23		26
Overhead : Machine shop	9		24	
Assembly deptt.	10		10	
		19		34
		Rs. 50		Rs. 65

Justification of absorption method used

 In general, time-based absorption methods are equitable, because most of the items of overheads vary with time. In the machine shop, a considerable proportion of overhead will be incurred as a result of machine running time. Consequently, machine hour rate method of absorption would provide an equitable base.

 In the assembly department, time spent on production is mainly labour-based. Hence a labour hour basis would probably be most equitable. A percentage of direct wages method may equally be applied as an equitable basis for absorbing assembly department overhead, because wage rates are constant.

Results, if sales and production of *P* are 300 units higher than the budget

		Rs.
Variable cost per unit of *P*		
Materials		8
Labour : Machine Shop	15	
Assembly Deptt.	8	23
Variable overhead[1]		
Machine shop 3 hrs. @ Re. 1/hr.	3	
Assembly Deptt. 4 hrs. @ Re. 0·50/hr.	2	5
Total Variable cost		36

Contribution from 300 extra units :	Rs.
Sales 300 × Rs. 60	18,000
Less : Variable cost 300 × Rs. 36	10,800
Extra contribution	7,200

 Since the company is operating over the break-even point, the entire extra contribution becomes extra profit.

Working Note :

   'Calculation of variable overhead absorption rates

	Machine Shop	Assembly Deptt.
Variable overhead	Rs. 26,000	Rs. 9,000
Absorption base	26,000 machine hrs.	18,000 labour hrs.
Absorption rate	Re. 1 per machine hr.	Re. 0·50 per labour hr.

Problem 48.

A factory with three departments uses a single production overhead absorption rate expressed as a percentage of direct wages cost. It has been suggested that, use of departmental overhead absorption rates would result in more accurate job costs. Set out below are the budgeted and actual data for the previous period, together with information relating to job No. 585.

		Direct wages (Rs. 000s)	*Direct labour hours* (000s)	*Machine hours* (000s)	*Production overhead* (Rs. 000s)
Budget :					
Department *A*		25	10	40	120
B		100	50	10	30
C		25	25	—	75
	Total	150	85	50	225
Actual :					
Department *A*		30	12	45	130
B		80	45	14	28
C		30	30	—	80
	Total	140	87	59	238

During this period, Job No. 585 incurred the actual costs and actual times in the departments as shown below :

	Direct material Rs.	*Direct wages* Rs.	*Direct labour hours*	*Machine hours*
Department *A*	120	100	20	40
B	60	60	40	10
C	10	10	10	—
	190	170	70	50

After adding production overhead to prime cost, one-third of the amount is added to production cost for gross profit. This assumes that a reasonable profit is earned after deducting administration, selling and distribution costs. You are required to :

   (a) calculate the current overhead absorption rate ;

   (b) using the rate obtained in (a) above, calculate the production overhead charged to Job No. 585 and state the production cost and expected gross profit on this job :

(c) (i) comment on the suggestion that departmental overhead absorption rates would result in more accurate job costs, and (ii) compute such rates, briefly explaining your reason for each rate ;

(d) using the rates calculated in (c) (ii) above, show the overhead, by department and in total, that would apply to Job No. 585 :

(e) show the over/under-absorption, by department and in total, for the period using : (i) the current rate in your answer to (a) above, and (ii) your suggested rates in your answer to (c) (ii) above.

Solution :

(a) *Current overhead absorption rate*

$$\frac{\text{Budgeted production overhead}}{\text{Budgeted direct wages}} \times 100 = \frac{\text{Rs. } 2,25,000}{\text{Rs. } 1,50,000} \times 100 = 150\%$$

(b) *Job No. 585*   Rs.

	Rs.
Direct materials	190
Direct wages	170
Production overhead : 150% of Rs. 170	255
Production cost	615
Expected gross profit : 1/3 of Rs. 615	205
Selling price	820

(c) (i) Use of separate overhead absorption rates for each department would result in more accurate job costs where the incidence of production overhead varies considerably between departments. Department A incurs high production overhead in the form of depreciation and maintenance of machinery resulting from heavy use of machine time, whereas department B with five times the labour force of department A incurs only one-quarter of department A's overhead. The application of a single rate means that department A's overhead is averaged with those of department B and C resulting in distorted production costs. Jobs done in department A would be undercharged and jobs done in department B would be charged with some overhead relating to department A. As selling price is determined on a cost-plus basis, any defect in the method of costing is reflected in the selling price, and this may result in lost orders and reduced profits. Use of departmental absorption rates will ensure a more accurate distribution and absorption of overhead costs.

(ii) *Department A.* This department is heavily dependent on machine time involving production overhead such as depreciation and maintenance. Direct labour hours are small in number as compared with machine hours and an operator looks after more than one machine. Hence a machine hour rate is more appropriate for this department.

$$\text{Overhead rate} = \frac{\text{Budgeted overhead}}{\text{Budgeted machine hrs.}}$$

$$= \frac{\text{Rs. } 1,20,000}{40,000} = \text{Rs. } 3 \text{ per machine hour}$$

Department B. This department is only partially mechanised and thus production is labour dominated. Hence a direct labour hour rate is more appropriate. Hourly rate is preferred to a percentage of direct wages to avoid the problems of varying wage rates.

$$\text{Overhead rate} = \frac{\text{Budgeted overhead}}{\text{Budgeted direct labour hrs.}} = \frac{\text{Rs. 30,000}}{50,000}$$

$$= \text{Re. 0·60 per direct labour hour.}$$

Department C. The question of a machine hour rate does not come at all, because no machine hours are recorded. Since labour operations are the central factor, a labour based method seems to be more appropriate. There appears to be a single wage rate with Re. 1 per hour quoted three times. In such a case it would be immaterial, so far as product cost is concerned, whether a direct wages percentage rate or a direct labour hour rate is used. It is advisable to apply the direct wages percentage rate as it is easier to operate (which does not require a record of hours for absorbing overhead.)

$$\text{Overhead rate} = \frac{\text{Budgeted production overhead}}{\text{Budgeted direct wages}} \times 100$$

$$= \frac{\text{Rs. 75,000}}{\text{Rs. 25,000}} \times 100 = 300\%$$

(d) *Overhead absorbed by Job No. 585*

			Rs.
Department *A*	40 machine-hrs. @ Rs. 3		120
B	40 direct labour-hrs. @ Re. 0·60		24
C	300% of Rs. 10		30
			174

(e) *Over/(under) absorption of overhead*

	Deptt. A Rs.	*Deptt. B* Rs.	*Deptt. C* Rs.	*Total* Rs.
(i) *Using 150% on direct wages*				
Overhead absorbed	45	120	45	210
Actual overhead	130	28	80	238
Over/(under) absorption	(85)	92	(35)	(28)
(ii) *Using departmental absorption rates*				
Overhead absorbed	135	27	90	252
Actual overhead	130	28	80	238
Over/(under) absorption	5	(1)	10	14

SECTION III
ADMINISTRATION, SELLING AND DISTRIBUTION OVERHEAD

ADMINISTRATION OVERHEAD

Administrative division of an organisation is responsible for formulating the policies, directing the organisation in the desired direction and controlling the operations and expenses. Thus, the expenses in connection with these functions of the administrative division are called *Administration Overhead.*

Administrative functions include the activities of the—(a) Board of Directors and Secretaries, (b) Financial Accountants and Managers, (c) Law Officers, (d) Auditors, (e) General Administrative Officers, (f) Personnel Manager etc.

Major Administration expenses are as below :

Rent, rates and taxes of the administrative building ; repairs and maintenance of administrative building, furniture and equipment ; Travelling and conveyance ; Salaries and allowances ; Meeting Expenses ; Transport expenses ; Audit fees : Legal expenses ; Postage, telegram & telephone ; Stationery ; Personnel department expenses ; Correspondence, typing, filing etc. ; Depreciation of furniture and equipment and of administrative building (if owned) ; Directors' remuneration ; Bank charges etc.

Items of administration overhead are collected in *cost account numbers* in the same way as items of factory overhead are collected in *Standing order numbers.* In other words, standing order numbers are used for collecting factory overhead and cost account numbers are used for collecting administration overhead.

Treatment of Administration Overhead in Cost Accounts

Administration overhead may be treated in cost accounts in three different methods as explained below :

First method

Under this method administration overheads are transferred to *Costing Profit & Loss Account.* This transfer may be justified on the assumptions that administration expenses are of *fixed nature* and *no relationship between the administrative functions on the one hand and production, sales and distribution functions on the other, can be determined.* Thus, on these assumptions, administration expenses are treated as 'period cost' to be written off to the Costing Profit & Loss Account of the period concerned.

Second method

Under this method the administration expenses are apportioned to production functions and selling and distribution functions of the organisation. In this case, the assumption is that, any organisation has mainly two functions—(i) Production and (ii) Sales and distribution. So, in order to

ascertain the correct production overhead and also selling and distribution overhead, appropriate share of administration expenses must be included in both (in this case administrative function is not recognised for the purpose of recovery of overhead). All administration expenses incurred during a period are debited to Administration Overhead A/c and at the end of the year, the administration expenses attributable to production functions is transferred to Factory Overhead (i.e., Production Overhead) Account and administration expenses attributable to selling and distribution functions is transferred to Selling & Distribution Overhead A/c (*debiting* Production Overhead Account and Selling and Distribution Overhead Account respectively and *crediting* Administration Overhead Account).

The principal difficulty in applying this method lies in selecting appropriate *bases* for apportionment of the various items of administration expenses to other two overhead accounts mentioned above. The bases used are almost similar to those used for apportionment of production overhead. However, the bases used for apportionment of some typical items are mentioned below—

Expenses	*Basis of apportionment*
Expenses particularly spent for a division	Direct allocation
Typing	No. of letters typed
Correspondence	No. of letters drafted
Depreciation of office building	Floor area, Capital value
Invoicing expenses	No. of invoices
Filing expenses	No. of items filed
Legal expenses	No. of law suits
Office rent & rates	Floor area
Depreciation of office equipment	Capital value
Audit fees	Value of accounts, No. of accounts

When the amount of any administration expense is apportioned to Production Overhead, such amount is to be again apportioned to service departments and production departments of the production function. Service departments' share has again to be reapportioned to production departments in the usual manner and ultimately the recovery shall be done from production.

Third method

Under this method administration is treated as a separate function and administration expenses are treated in cost accounts in the same way as the expenses of other functions (i.e., Production, Sales and Distribution). It has been already mentioned that, administration expenses are the expenses relating to formulating the policies, directing the organisation and controlling the operations. These are treated as a separate function, like production function, sales function etc. Thus, the question comes as to how the administration expenses are absorbed in total cost. Administration

expenses are absorbed on some suitable basis. There are various bases each having its own merits and demerits. *The following are the possible bases* :

(a) *Works cost,* (b) *Number of units* or *quantity produced,* (c) *Sales value* or *Sales quantity,* (d) *Gross profit on Sales,* (e) *Conversion cost* etc.

Works cost is often taken as the best basis, because works cost is mostly influenced by all the functions of administration.

Administration Overhead is recovered, in this case, *as a percentage of Works Cost.*

So far as the accounting entries are concerned, all administration expenses are debited to Administration Overhead Account. For recovery, Finished Stock Account is debited and Administration Overhead Account is credited with the proportionate amount calculated at the recovery rate (which is often expressed as a percentage of the Works Cost). For example, if the Works Cost of a particular job or work order is Rs. 19,500 and the recovery rate (expressed as a percentage on works cost) is 20%, the amount to be recovered by charging to Finished Stock Account shall be $\frac{20}{100} \times$ Rs. 19,500 or Rs. 3,900.

Control of Administration Overhead

Administration expenses are mostly fixed in nature. So, these expenses are almost non-controllable. To speak more specifically, it is very difficult to control administration expenses fully. However, the following measures may be taken for the purpose :

(a) Control reports may be prepared and the results may be compared with the past results.

(b) Flexible budget may be prepared forecasting the amount of expenses at different levels of activities. The actual figures may be compared with the budgeted figures.

(c) Standards may be set up. Actual expenses may be compared with the predetermined standards.

SELLING & DISTRIBUTION OVERHEAD

Publicity expenses, selling expenses and distribution expenses are commonly called *marketing cost.* I.C.M.A., London, has defined this cost as below :

Marketing Cost

Marketing cost represents the cost incurred in publicising and presenting to customers the product of the undertaking in suitably attractive forms and at acceptable prices, together with the costs of all relevant research work, the securing of orders and, usually, delivery of the goods to customers. In certain cases, cost of after-sale services and/or order processing may also be included.

Publicity Cost

It refers to that portion of marketing cost which is incurred in advertising and sales promotion as aids to the sales of goods or services.

Selling Cost

It refers to that portion of the marketing cost which is incurred for securing orders.

Distribution Cost

It refers to that portion of marketing cost which is incurred in connection with warehousing the saleable products and delivery of products to customers.

Features of Selling & Distribution Expenses

The following are the principal features of selling and distribution expenses :

(a) These are identifiable only with the products *sold.*

(b) Amounts of selling and distribution expenses are *variable* according to (i) distance of market, (ii) terms of sales, and (iii) customers' behaviour.

Analysis of Selling and Distribution Overhead

The following are the different ways of analysing the selling and distribution overhead :

(i) *Analysis by nature of expenses*
By analysing the expenses by nature we find—
Remuneration, Fixed charges, Freight & duty, Packing, Sales promotion, Direct materials, Miscellaneous discounts and allowances etc.

(ii) *Analysis by operational functions*
By this analysis we find—
Direct selling expenses, Advertising and sales promotion, Transportation, Credit and collection, Warehousing and storage, Financial, General administration and Miscellaneous.

(iii) *Analysis by products* or *Group of products*
If a concern produces a number of products, selling and distribution overhead may be analysed by products or group of products.

(iv) *Analysis by sales area or division*
Selling and distribution overhead may be analysed by area of sales like Central Calcutta, North Calcutta, South Calcutta etc. or West Bengal, Bihar, Orissa etc. or Southern India, Eastern India, Western India etc.

(v) *Analysis by salesmen*
Analysis of selling and distribution overhead is often done by salesmen like P. C. Ghosh, M. Mahadevan, S. Tebriwalla, B. S. Sandhu etc.

(vi) *Analysis by channels of distribution*

In this case selling and distribution overhead is analysed according to wholesalers, retailers and consumers.

(vii) *Analysis by type of customers*

In this case analysis is done according to inland customers, foreign customers, Government customers, private customers, country wholesalers, country retailers etc.

The above are the different ways in which analysis of selling and distribution overhead can be done. Elaborate analysis is always expensive. So, that much elaboration is desirable as would be suitable for the type of product and the method of marketing.

Selling and distribution overhead, analysed in whatever way, *is to form a part of the cost of goods sold.*

Thus, the question comes as to how selling and distribution expenses are included in the cost of goods sold. This is done through the following processes :

(a) The expenses which are considered *direct* may be allocated to functions, areas, products, salesmen etc. as far as practicable.

(b) Other expenses which cannot be directly allocated (i.e., the general selling and distribution expenses) are to be apportioned on some suitable basis. The bases commonly used for apportionment of selling and distribution overhead are given below :

Selling and distribution overhead	*Base*
1. Advertisement and Sales promotion	1. *Number of units sold* where there is uniform selling price, or *Sales value*
2. Warehousing and Storage	2. *Volume of sales, area occupied,* etc.
3. Rent	3. *Floor space*
4. Insurance	4. *Value of property*
5. Transport	5. *Weight* or *number of packages* or *distance carried* or Weight × distance carried should be the best basis
6. Credit and collection	6. *Number of orders*
7. General Accounting	7. *Number of orders, or Number of transactions*
8. Depreciation	8. *Capital value of assets*

Note : When administration overhead is apportioned to production function and selling and distribution functions (as indicated in the second treatment of administration overhead) a share of administration expenses comes to selling & distribution overhead which is also to be apportioned along with the above.

Absorption of Selling and Distribution Overhead

Selling and distribution overhead may be recovered in any of the following methods :

(a) *As a rate per article*

The total selling and distribution expenses are divided by the number of units sold to obtain the rate per article. Advertisement, transport, warehousing etc. may be recovered by this method. The method becomes appropriate, if the sales units are uniform.

(b) *As a percentage of the selling price of each article*

Direct selling cost, general administration and finance cost etc. which are of *fixed nature* are suitably recovered by this method. The percentage is ascertained by analysing the past records and is worked out as below :

$$\frac{\text{Fixed selling and distribution expenses for the period}}{\text{Total turnover for the period}} \times 100$$

(c) *As a percentage of works cost*

Under this method, a certain percentage on works cost of the goods sold is taken as a basis for the absorption of selling and distribution expenses. The percentage of selling and distribution overhead on the works cost of goods sold is worked out by an analysis of past results. This method is also used for absorption of selling and distribution expenses of *fixed nature*. Except in case of one product only, this method is unsound.

Of all the methods discussed above, rate per article method is considered as the best, particularly when the production units are uniform in nature.

So far as the accounting entries are concerned, all the selling and distribution expenses incurred are *debited to Selling and Distribution Overhead Account* and for recovery of such overhead *Cost of Sales Account* is debited and Selling and Distribution Overhead Account is credited.

Control of Selling and Distribution Overhead

Control of selling and distribution overhead is a very difficult job owing to the following reasons :

(i) Control cannot be exercised upon the customers and competitors.

(ii) It is difficult to correctly estimate the market potentials.

(iii) Market price fluctuations are not always dependent upon cost factors.

(iv) Capacity of any sales organisation cannot be correctly predetermined.

However, the following methods may be adopted for the purpose of control :

(a) Selling and distribution cost control reports may be prepared and results may be compared with the past records,

(b) Flexible budgets may be prepared showing the expenses at different levels of activities. Actual figures may be compared with the budgeted figures.

(c) Standards may be set up. Actual expenses may be compared with the predetermined standards.

Production Overhead and Selling & Distribution Overhead Compared

When Production Overhead is compared with the Selling and Distribution Overhead, certain similarities and dissimilarities are observed. The following are the observations :

Points of similarities

1. Selling and Distribution Overheads are analysed according to nature of expenses in the same way as the production overheads are collected according to standing order numbers.

2. When Selling and Distribution Overheads are analysed by functions, it becomes similar to apportionment of production overhead to various departments.

3. The general selling and distribution expenses which cannot be allocated directly are apportioned to sales functions (of different territories, products or salesmen) in the same way as the production overheads of the service departments are apportioned to different production departments.

4. Analysis of selling and distribution overheads by products or product groups is similar to recovery of production overhead from products.

Points of dissimilarities

1. Since most of the selling and distribution overheads cannot be predetermined in terms of standard, the analysis thereof is primarily historical in nature ; but standard can be set for most of the production overheads.

2. Analysis of Selling and Distribution Overheads is operated ordinarily outside the books of accounts. So, their analysis is mainly in the nature of what is called *statistical costs*. This is not so, in case of production overheads.

3. Selling and Distribution Overheads are chargeable to cost of sales, while production overheads are chargeable to cost of production.

4. Accounting for production overheads is a continuous process, while analysis of selling and distribution overheads is not a continuous process.

5. Production overheads may be allocated and apportioned to *cost centres*, but cannot be normally charged to *cost units* like products, jobs or processes. Selling and Distribution expenses can be apportioned and directly allocated to products and also to territories, salesmen, customers etc.

<div align="center">WORKED OUT PROBLEMS</div>

Problem 1.

A company manufactures export quality footballs of four different sizes—No. 2, No. 3, No. 4 and No. 5. Prepare a statement showing the

apportionment of selling and distribution expenses given below to each size on the bases indicated against each expense and express the total expenses apportioned to each size as (i) cost per unit, and (ii) percentage of sales value.

Expenses	Rs.	Basis of apportionment
Salesmen's Salaries	12,000	Direct charge
Salesmen's Commission	40,000	Sales value
Sundry Sales Office Expenses	19,200	No. of customers' order
Specific Advertisement	80,600	Direct charge
General Advertisement	25,000	Sales value
Packing & Delivery	40,470	Size of product
Credit & Collection	9,600	No. of customers' order
Warehousing Expenses	6,390	Size of product

Other information	Total	No. 2	No. 3	No. 4	No. 5
Sales Turnover (in Rupees)	10,00,000	1,50,000	2,00,000	2,50,000	4,00,000
No. of Salesmen of equal salary	30	6	5	4	15
No. of customers' order	192	40	30	50	72
Share of Specific Advertisement (%)	100	15	25	20	40
No. of units sold	7,300	1,500	1,200	1,600	3,000
Volume of each size in cubic centimetre/unit		400	500	600	700

Solution :

Statement of Overhead Distribution

Items of Expenses	Basis of apportionment	Total Rs.	No. 2 Rs.	No. 3 Rs.	No. 4 Rs.	No. 5 Rs.
Salesmen's Salaries	No. of Salesmen	12,000	2,400	2,000	1,600	6,000
Salesmen's Commission	% on Sales (4 %)	40,000	6,000	8,000	10,000	16,000
Sales Office Expenses	No. of orders (40 : 30 : 50 : 72)	19,200	4,000	3,000	5,000	7,200
Specific Advertisement	Direct charge (15 : 25 : 20 : 40)	80,600	12,090	20,150	16,120	32,240
General Advertisement	% on Sales (2·5%)	25,000	3,750	5,000	6,250	10,000
Packing & Delivery	Units sold × Unit volume (30 : 30 : 48 : 105)	40,470	5,700	5,700	9,120	19,950
Credit & Collection	No. of orders (40 : 30 : 50 : 72)	9,600	2,000	1,500	2,500	3,600
Warehousing Expenses	Unit sold × Unit volume (30 : 30 : 48 : 105)	6,390	900	900	1,440	3,150
Total		2,33,260	36,840	46,250	52,030	98,140
Cost per unit sold			Rs.36,840 / 1,500 = Rs. 24·56	Rs.46,250 / 1,200 = Rs. 38·54	Rs.52,030 / 1,600 = Rs. 32·52	Rs.98,140 / 3,000 = Rs. 32·71
% of Sales value			24·56%	23·12%	20·81%	24·53%

Problem 2.

Bipani Ltd. is a retail organisation which operates three sales departments and an administration department in a large supermarket complex. Each sales department has a manager and its own prescribed gross margin relating to selling price.

Exceptionally, the general manager permits the departmental manager to reduce the selling price of a product by giving a quantity discount, a special price for a large order or for an item of out-dated stock.

The following data are given :

	Audio and Video equipment	Electrical appliances	Furniture
	Rs.	Rs.	Rs.
Stock at 1st April :			
Cost	1,20,000	80,000	2,00,000
At full sales value	2,00,000	1,10,000	2,80,000
Transactions during April :			
Purchases	1,50,000	40,000	1,60,000
Net sales	2,15,000	63,000	2,24,000
Price reductions approved	5,000	3,000	7,000

Expenditure incurred during April was :

Item	Amount Rs.	Basis of apportionment to sales and administration department
Rates	4,000 ⎱	⎰ Area occupied
Light and heat	2,000 ⎰	
Advertising	35,250 ⎱	
Transport	25,850	Sales value for the month
Insurance	3,525	before any reduction
Miscellaneous	1,175 ⎰	
Canteen	4,125	Number of employees
Salaries and wages	24,910 ⎱	See detailed information given
Depreciation	3,750 ⎰	below
Administration	2,500	Direct

Other detailed information for April was :

	Salaries and wages Rs.	Depreciation Rs.	No. of Employees	Area occupied in sq. metres
Audio and video equipment	11,900	500	27	600
Electric appliances	2,000	750	4	200
Furniture	6,000	1,000	15	500
Administration	5,010	1,500	9	300
Total	24,910	3,750	55	1,600

Each month the total costs of the administration department are apportioned to the three sales departments on the basis of the sales values for the month before any reduction.

Using the data given (a) calculate the value of stock at 30th April for balance sheet purposes and (b) prepare a tabulated profit and loss statement for each sales department for April.

Solution :

Workings—

Schedule of overhead apportionment

Item	Basis	Total Rs.	Audio Rs.	Electrical Rs.	Furniture Rs.	Administration Rs.
Rates	Area	4,000	1,500	500	1,250	750
Light and heat	Area	2,000	750	250	625	375
Advertising	Gross sales value	35,250	15,000	4,500	15,750	
Transport	Gross sales value	25,850	11,000	3,300	11,550	--
Insurance	Gross sales value	3,525	1,500	450	1,575	--
Miscellaneous	Gross sales value	1,175	500	150	525	--
Canteen	No. of employees	4,125	2,025	300	1,125	675
Salaries and Wages	Allocated	24,910	11,900	2,000	6,000	5,010
Depreciation	Allocated	3,750	500	750	1,000	1,500
Administration	Allocated	2,500	--	--	--	2,500
Total		1,07,085	44,675	12,200	39,400	10.810
Reallocation of Administration	Gross sales value	-	4,600	1,380	4,830	(10,810)
Total		1 07 085	49,275	13,580	44,230	—

(a) Value of stock at 30th April

	Audio and Video Rs. 000	Electrical Rs. 000	Furniture Rs. 000	Total Rs. 000
Opening Stock	1,20,000	80,000	2,00,000	4,00.000
Purchases	1,50,000	40,000	1,60,000	3,50,000
	2,70,000	1,20,000	3,60,000	7,50,000
Sales (at cost)				
$\frac{1\ 20\ 000}{2,00,000} \times (2,15,000 + 5,000)$	(1,32,000)			(1,32,000)
$\frac{80.000}{1,10,000} \times (63,000 + 3,000)$		(48,000)		(48,000)
$\frac{2,00,000}{2,80,000} \times (2,24,000 + 7,000)$			(1,65,000)	(1,65,000)
Closing Stock	1,38.000	72.000	1,95,000	4,05,000

(b) Profit and loss statement for April

	Audio and Video Rs.	Electrical Rs.	Furniture Rs.	Total Rs.
Sales (net)	2,15,000	63,000	2,24,000	5,02,000
Less : Cost of sales	(1,32,000)	(48,000)	(1,65,000)	(3,45,000)
Gross Profit	83,000	15,000	59,000	1,57,000
Less : Expenses	(49,275)	(13,580)	(44,230)	(1,07,085)
Net Profit	33,725	1,420	14,770	49,915

SECTION IV

SOME ITEMS OF EXPENSES—THEIR NATURE AND TREATMENT IN COST ACCOUNTS

1. Carriage and cartage inward

Normally, carriage and cartage inward for materials purchased is included in the cost of materials. Carriage for bringing materials from stores to the workshop and also the cost of internal transport facilities are treated as works overhead.

The expenses on carriage inward for bringing back the goods sold to customers may be treated differently, depending upon the cause of such return. If the return is due to defective manufacture, carriage inward, in that case, should be treated as works overhead. If the return is due to defect arising out of faulty packing, the carriage inward should be treated as selling and distribution overhead.

2. Carriage outward

It is an expense incurred for delivery of goods to the customers. If the customers pay the cost, the carriage outward is included in selling price and, therefore, it has to be excluded from cost. If, however, delivery is made free of cost, carriage outward constitutes a cost to be included in the distribution overhead.

3. Insurance premium

Premium may be paid for insuring property against fire, accident etc. and in respect of Employees' State Insurance.

Fire insurance premium for insuring stock of materials should be included in stores overhead and that for the workshop in general is usually treated as works overhead and then apportioned to various departments on some suitable basis. If any department deals in highly inflammable commodities, premium at higher rate is chargeable. So, the excess of this premium over the normal premium should be exclusively allocated to that department.

Fire insurance premium paid in respect of buildings should be apportioned to various overhead accounts depending upon the rental value of the space occupied by factory, godown, general office etc. If the premium on factory building is charged at a higher rate, such extra charge should be allocated to works overhead only.

Workmen's compensation premium is treated as works overhead and is then apportioned to various departments of the factory on the basis of wages paid in each department.

Employers' contribution to Employee's State Insurance is an indirect expense and has to be apportioned to works overhead, administration overhead and selling and distribution overhead, according to employment of workers in each function. As an alternative, such contribution, in respect of the direct workers, may be taken as a part of wage and treated as direct wage.

Premium on insurance of goods sent to customers through transport is an item of Selling and Distribution overhead.

4. Packing charges

Packing is done for three different purposes :

(*a*) for protecting an article or for containing an article (for example, tubes, bottles, cartons etc.)

(*h*) for facilitating delivery

(*c*) for effecting advertisement, partly at least.

Packing cost for '*a*' above is a direct expense to be included in the prime cost. Packing cost for '*h*' above is to be treated as distribution overhead and packing cost for '*c*' above is to be treated as selling overhead.

Where one packing serves all the three purposes, the cost should be apportioned to cost of production and selling and distribution overhead on some equitable basis.

5. Royalties

Royalties refer to payment by the lessee, patentee etc. to the lessor or patentor in respect of use made by him of the asset or formula etc. The payment may be either a lump amount during a period or at fixed rate per unit of output produced or sold. When royalties are paid in lump as a rental, they should be treated as Works Overhead. When royalties are paid at a rate per unit produced, they may be charged to cost of production as a chargeable expense. When royalties are paid at a rate per unit sold, they should be treated as an item of selling and distribution overhead.

6. After-sales services cost

Many concerns offer free service of repair and replacement during a particular period after sale. The concern, therefore, incurs cost in respect of salaries, wages and travelling expenses of the service staff and also in respect of parts and components replaced free of cost. These items together constitute 'after-sales services cost' to be treated as selling overhead in Cost Accounts.

7. Transit insurance

This insurance covers the risk of goods lost while in transit. This insurance is done for delivery of goods to the customers through common carriers. Premium paid for such insurance is, therefore, treated as distribution overhead.

8. Advertisement and sales promotion

Expense on advertisement may be incurred for various purposes mentioned below :

(a) for short-period sales promotion for single product or all products,

(b) for long-term sales promotion for single product or all products,

(c) for staff requirements, change of office address or telephone numbers opening new branches etc. ; and for fulfilling legal requirements

in respect of closure of share transfer books, calling meetings, notices of legal proceedings etc.

(d)   for inviting tenders or quotations for purchase etc.

Short-period advertisement cost for sales promotion should be treated as selling overhead to be recovered from the sales of the period.

Long-term sales promotion cost should not be charged as selling overhead in the year of its incidence. Only that part of the cost which benefits the sale of the period should be treated as selling overhead to be recovered from the sales of that period and the balance should be deferred and charged to the goods sold in future periods as selling overhead.

Advertisement cost for the purpose mentioned in 'c' above should be treated as administration overhead.

Advertisement cost for inviting tenders etc. for purchase should be treated as a cost of purchase department to be included in the cost of particular material purchased or to be apportioned to different materials purchased or to be included in works overhead, depending upon the individual circumstance.

9.   Rent of factory paid and notional rent

Rent paid for hired factory building is treated as works overhead and apportioned to various departments on the basis of floor space occupied. Even when the building is owned, rent is often taken into cost for the sake of comparison of cost in different factories where some factories may have hired buildings and others may have owned buildings. Rent of owned building is *notional rent*. This is also treated in the same way as rent paid, but this does not find place in financial accounts. So, at the time of reconciliation between cost and financial accounts this item requires adjustment.

10.   Managerial remuneration

This expense refers to the remuneration of directors, managers etc. The treatment of this item depends upon the functions performed by such directors or managers. Remuneration of the works manager, technical director etc. who work in connection with production is obviously treated as works overhead. Similarly, remuneration of the administrative directors, general manager etc. who perform general administrative functions should be treated as administration overhead. The remuneration of the sales directors, sales manager etc. should be treated as selling overhead. Similarly, remuneration of the transport manager should be treated as distribution overhead.

11.   Research and experimental cost

These are costs incurred in the discovery of new ideas or processes by experiment or otherwise and for putting the results of such experiments on commercial basis. Research may also be done for improvement of an existing process or product.

Research may be of two types—(i) *Fundamental research* and (ii) *Applied research.*

(i) *Fundamental research* does not aim at a specific tangible result and is a continuous process. So, cost incurred on such a continuous process during a particular period should be treated as works overhead of that period. If, however, the process is not a continuous one for any reason, the cost may be spread over a number of years depending upon the amount involved.

(ii) When expenses are incurred on *applied research* for improving an existing product or method, such expense should be treated as works overhead of the period in which they have been incurred. When expenses are incurred in a research for new product or method, separate project number should be allotted for research for each purpose and expenses should be collected accordingly. Now, this research may either end in failure or end in success. In case of failure, the cost should be written off to Costing Profit and Loss A/c. If it is a success, the expenses should be debited to *Development Cost.* The total of research and development cost for each project should be treated as deferred revenue expenditure to be charged to product or products over a number of periods. If such research and development cost relates to a particular product, it should be directly charged to that product only over a number of periods. If it relates to a production method, such cost should be charged to works overhead account over a number of periods.

12. Drawing and design office costs

When drawing office costs can be identified with any job, the job can be directly debited with such cost. Where the drawing and design office works as a service department rendering service in general to all production departments, the cost should be apportioned to the production departments served on some suitable basis. The share of such cost coming to each production department is included in its works overhead.

13. Expenditure of accounting offices

Expenses of financial accounting department as well as costing department should be considered as the expenses for the business as a whole. Hence, the expenditure should be apportioned to various functions—production, administration, sales and distribution on some suitable basis. When apportioned, the share coming to each function should be treated as overhead of the respective function. Owing to practical difficulties in the aforesaid apportionment, the expenditure of accounting offices are often treated as administration overhead.

14. Overtime and night work wages

The treatment of overtime and night work wage in cost accounts depends upon the circumstances in which such work becomes necessary.

When overtime or night work is necessary due to special desire of a customer for getting the work completed within the scheduled time or earlier,

the overtime premium is charged to the job concerned as direct wage. [Overtime on night work is paid at a higher rate. The excess of this rate over the normal rate is premium. In this case the entire wage including, the premium is charged directly to the job concerned.]

If overtime or night work is necessary in order to make up the delay caused by general inefficiency of the workers, supervision, stores etc. or due to wrong planning and improper co-ordination, the overtime premium is charged to production overhead and recovered from products. If overtime work is necessary in order to increase the output to cope with the increased market demand, the amount should be treated as overhead of the department which works overtime. If overtime work is necessary in one department due to fault of another department, the overtime premium should be charged to the department making the fault.

Cost of overtime work undertaken for a capital project should be charged to the project order concerned.

When overtime work is necessary due to seasonal nature of the industry, the overtime wage should be treated as *general overhead of the factory* or should be taken as deferred revenue expenditure to be equitably charged to production over the entire business cycle.

Cost of overtime work undertaken due to abnormal conditions like war, flood, earthquake etc. should not be charged to cost, but should be written off to Costing Profit & Loss Account.

15. Idle time

[This has been discussed at length in Chapter 4.]

16. Idle facility

When a direct worker remains idle the wage paid for the time during which he remains idle is called *idle time cost* or simply *idle time*. When plants and equipment remain idle, certain items of expenses continue to be incurred. These costs are called *idle facilities*. If no expenditure is involved during the period of idleness of plants and equipment, there would be no cost like idle facilities.

When idle facilities are regular and unavoidable and are due to any one or more of the following reasons, the cost is included in *production overhead*.

  (*a*) Where method of production requires plants and equipment to be kept idle for sometime, unavoidably,
  (*b*) Idleness between completion of one job and starting of the next job,
  (*c*) Seasonal nature of work,
  (*d*) Faulty shop management,
  (*e*) Impossibility of fully employing the plants and equipment, for unavoidable reason.

If, however, the idleness is caused by shortage of work during, say, trade depression or any other reason beyond the control of the organisation,

the cost *should not be treated in Cost Accounts, but should be written off to Costing Profit & Loss Account.*

17. Canteen expense

Canteen expense borne by the employer is a welfare measure. If canteen is run on a 'no profit no loss' basis, there is no cost, because all costs are recovered through meal charges etc. If canteen is subsidised, the employer incurs cost to the extent of subsidy. This cost is treated as works overhead. Separate standing order numbers are used for debiting the expenses of workers' canteen, staff canteen, officers lunch room etc. Receipts are also credited to such standing order numbers separately. The debit balance indicates cost to be apportioned to production departments on the basis of number of workers. Apportionment may also be done on the basis of number of meals served for each cost centre.

18. Compensatory payment to workers

These payments may be of two types—(1) Compensation paid to workers on retirement (in the form of gratuity etc.) or on termination and (2) compensation under Workmen's Compensation Act. The former is of regular nature and should be treated as overhead. The latter depends upon the number of accidents, extent of injury, length of service etc. and hence cannot be of regular nature. In the second type, therefore, payment should be estimated on a long-term basis and a proportionate amount should be charged as overhead in each period so that the charge becomes uniform.

19. Dearness allowance, house rent allowance, compensatory allowance etc.

Dearness allowance, house rent allowance, compensatory allowance etc. are paid to workers to cover increased cost of living, to hire accommodation where quarters cannot be allotted and to compensate extra hardship of a particular locality, respectively, without changing the scale of basic wages.

These allowances may be treated in Cost Accounts in different ways :

(i) Allowances paid to direct workers may be tagged with their basic wages and charged to the respective jobs or processes on which they work, and allowances paid to indirect workers may be debited to the overhead of the department in which they work.

(ii) Allowances paid to all the workers may be treated as overhead, allowances to workers of a particular department being charged to the overhead of that department and recoverd from the production units of that department.

(iii) A separate rate of recovery of allowances may by worked out as a percentage of allowances on basic wages. (The rate may be worked out on the basis of historical cost or predetermined cost). Initially labour cards may be prepared on the basis of basic wages. Finally, the separate recovery rate may be applied to ascertain the total labour cost of a job or standing order number.

The second way, mentioned above, is in use in most cases,

20. Fire prevention cost

Industries located in big cities, where fire service stations are provided by the government or local authorities, need not maintain a fire service department. They need only a few fire service equipment to be provided according to provisions of Factories Act. The cost should, therefore, be included in the maintenance cost.

Where outside fire services are not available, at least big industries have to maintain a separate fire service department, the cost of which is apportioned to production departments and other service departments on the basis of some technical estimates, considering the fire risk involved, value of materials, area etc. Recovery from products is done in the usual manner.

21. Fringe benefits to workers

Fringe benefits given to workers are not related to the direct efforts of the workers. These benefits include leave and holiday pay, sick pay, canteen facilities, employer's contribution to provident fund, E.S.I., gratuity and pension schemes, medical benefit, attendance bonus, shift allowance etc.

Fringe benefits cost cannot be allocated to cost units, but they can be allocated to the particular cost centres in which the workers work. The cost is, therefore, treated as departmental overhead. It may be pointed out that fringe benefit cost is not incurred uniformly over the periods owing to various reasons. Estimates are to be made on long-term basis and a proportionate amount may be charged to each period for the sake of uniformity.

22. Maintenance and repairs

Maintenance service may be of two types : (i) *Preventive maintenance* and (ii) *Corrective maintenance.* The former is a continuous process and involves a regular check-up and inspection and provision of repair wherever necessary, the latter arises on special occasions caused by sudden breakdown, stoppage etc.

Maintenance and repair cost is treated as production overhead. Expenses should be charged to a standing order number against each department or cost centre.

Expenditure on heavy overhaul should not be entirely charged to the period's overhead. It should be treated as a deferred revenue expenditure.

When the maintenance and repair increase the productive capacity or earning capacity of the machinery or plant, the expenditure is capitalised and is *excluded from Cost Accounts.*

23. Power cost

Expenditure on electricity, gas, steam, compressed air etc. are referred to as power cost. Power, particularly, electricity and gas may be purchased from outside or may be internally generated. Power purchased from

outside may be allocated to the departments or cost centres on the basis of meter reading. If no separate meters are provided, the cost may be apportioned on the basis of kwh., horse power, wattage etc. of the machines. Kwh. multiplied by machine hours is a suitable basis. Other technical estimates aimed at rational apportionment may also be used. The power cost does not only mean the value of the power units purchased, but it also includes—minimum charge irrespective of the quantity of consumption, peak charge for maximum quantity consumed at any time, low power factor penalty etc. Each of these charges should be apportioned to various plants according to the factors which cause the incidence of such charges.

When power is generated, the power house is treated as a separate cost centre and, therefore, all expenses are charged to the power house. The power house cost is then apportioned to other cost centres. Power house cost should be classified as *fixed cost* and *variable cost*, fixed cost being apportioned on the basis of *maximum power consuming capacity* and the variable cost being apportioned on the basis of *actual consumption*.

24. Warehouse rent

This item of selling and distribution expense should be apportioned in the ratio of floor space or volume occupied by each item of warehouse stock. Alternatively, apportionment may be done on the basis of number of packets when they are uniform in size. Period of storage and weight of the products may be technically estimated for using as bases of apportionment.

25. Market research expenditure

This expenditure is incurred for a continuous study of the market for either a particular product or for all products of the organisation. The study is undertaken to understand the potential demand, future trends of the market, consumers' behaviour, taste and habit, possibility of entry of competitors, trading practices etc.

The expenditure is treated as selling overhead and is accounted for in the usual manner.

26. Defective work

Output below the standard specification is termed as defective work. Defective work can be rectified by some additional expenditure called *salvage cost* or *re-work cost* or *rectification cost*. Defective work may be either inherent in the process of manufacture or it may arise abnormally. The cost arising out of the former cause is included in the cost of production, while that arising out of the latter cause is written off to costing Profit & Loss A/c.

27. Spoilage (spoiled work)

Output below the standard specification and not subject to rectification is called spoilage or spoiled work. The spoiled work has to be rejected. Some of the spoiled work may be sold as 'seconds', but most of them are

to be sold as scrap. If there is no market value of the spoiled work it is treated as *waste*.

Normal spoilage (i.e., loss due to spoilage after considering the value realised being within normal limit) is either charged to the Job or work order from which spoilage arises or it is charged to the production overhead to be recovered from all products.

Cost of abnormal spoilage is written off to costing Profit & Loss Account.

Cost of spoilage due to very rigid specification should be absorbed by *good production units.*

28. Scraps

Scraps indicate incidental material residue coming out of some manufacturing processes. Scraps are of very small value and such value may be realised without any further expenditure or process.

The treatment of scraps depends upon the quantum of value.

If the value is negligible it may be excluded from cost. This means that the cost of scraps is borne by the *goods units* and the value realised is treated in financial accounts as miscellaneous income.

When the value is not negligible, the value realised is credited to Production Overhead to reduce the overhead recovery rate.

When the value is significant, the Scrap Account is debited with the full cost of material and the job is credited. (This can be done when the scrap can be identified with a job.) The value of scrap realised is credited to the Scrap Account, the balance of which is written off to costing Profit & Loss Account.

29. Wastes

Basic raw materials lost in processing is referred to as waste. Waste has no realisable value. Waste is either visible or invisible. If there is any shrinkage, evaporation etc. the waste is invisible. If the waste is in the form of dusts, refuses etc. it is visible. Sometimes certain visible wastes have a little re-use value. For example, slags of some smelting industries may be used for filling low lands for converting them into habitable lands. Slags of Iron & Steel industries are now being used as raw materials for cement industries

Normal waste is absorbed by the net output, but abnormal waste is written off to costing Profit and Loss Account.

30. Profit-sharing bonus

Bonus paid to workers out of profit is normally an appropriation of profit and hence it should be *excluded* from cost. But some accountants suggest that bonus paid out of profit is nothing but *deferred wages* and hence the *entire amount* should be treated in Cost Accounts by charging it to the overhead of the function concerned (i.e., production overhead,

administration overhead, selling and distribution overhead etc. according to the amount paid to employees under each function). If this is accepted bonus paid to *direct workers* should be treated as an element of direct wages and those paid to *indirect workers* should be treated as overhead.

However, under the provisions of the *Payment of Bonus Act*, 1965, a minimum bonus is payable, even if there is no profit. Thus, this amount (minimum) of bonus should, at least, be treated in Cost Accounts, even if we accept the idea that bonus paid out of profit means appropriation of profit.

31. Training cost

Organisation of a training scheme is now a common feature in almost every manufacturing concern, either on own initiative or under obligation to the Government. Most of the concerns maintain a separate training section treated as a service cost centre. The expenses of the training centre include —salaries and allowances of the trainees and training staff; fees paid to outside organisations for imparting special training to the trainees of the organisation, materials, tools and equipment required for training etc. All these costs are debited to separate standing order numbers. These costs and the share of the expenses of other service cost centres applicable to the training section are allocated to the training service cost centre. The total cost of the training service cost centre is then apportioned to production cost centres in the usual manner, usually on the basis of the number of trainees in each cost centre.

Trainees may produce some goods or services in course of their training. The cost of such goods may be estimated and credited to training service cost centre, debit being given to the production order concerned.

32. Bad debt

Bad debt to some extent is almost unavoidable, if goods are sold on credit. Bad debt may be classified into *normal bad debt* (limited upto a certain percent of credit sales) and *abnormal bad debt*. Normal bad debt should be included in the selling overhead, while the abnormal bad debt should be *excluded from cost* and written off to costing Profit & Loss Account.

33. Discounts

Discounts are of two types – *trade discount* and *cash discount*. Trade discount received on purchases is deducted from the price of purchase and trade discount allowed on sales is deducted from gross selling price. So, trade discount does not enter into cost accounts.

Treatment of cash discount depends upon the treatment of interest on capital. Cash discount is nothing but a payment to compensate interest foregone by the party making the payment. Cash discount may be allowed to customers or received from suppliers. The former is an expense and the latter is a revenue. There is a controversy as to whether interest on

capital should be included in cost or not.   If interest is included in cost, discount should also be included on the same grounds. [See, 43 below]

34. Fines realised from workers

Fines recovered from workers cannot be treated as an income or receipt. According to Payment of Wages Act, fines recovered from workers are to be credited to a Separate Fine Fund which can be utilized for labour welfare purposes. So the receipt of fines and their utilization have no place in cost accounts.

35. Materials and store-handling expenses

This expense is quite distinct from storage expense. This expense includes expenses for handling raw materials, work-in-progress and finished goods, expenses for weighing of materials at different stages, expenses for movement of materials from one department to another etc.

The expense is treated as works overhead and is apportioned to various departments on the basis of value, weight, volume or number of requisitions handled whichever appears to be rational.

36 Hire of accounting machine

The cost may be apportioned to Works overhead, Administration overhead and Selling and Distribution overhead on the basis of services rendered by the machine to manufacturing, administrative, selling and distribution functions.

Man-hours, machine-hours, number of cards punched etc. are the bases of apportionment.

37. Cost of patents

Patent fees may be paid periodically as a fixed charge or it may be paid on the basis of units produced or units sold. If it is paid periodically as a fixed charge or on the basis of units produced, it is treated as factory overhead. If it is paid at a rate per unit produced, it may also be treated as a direct charge to the cost of production.   If, however, it is paid on the basis of units sold, it is treated as selling overhead.

38. Loss of stores

Loss of stores while in storage may be within normal limit which is also unavoidable, or it may arise due to abnormal reasons. The former is referred to as normal loss, while the latter is referred to as abnormal loss. Normal loss is treated as stores overhead, while abnormal loss is written off to costing Profit & Loss Account.

Loss of stores in process may also be normal or abnormal. Normal loss is shared by the good output, while abnormal loss is credited to the process account, debit being given to abnormal loss account which is written off to costing Profit & Loss Account.

39. Technical director's fee

The expense is connected with production function and hence it should be treated as works overhead. If the technical director looks after power-house, maintenance department, production department etc. his fees should be apportioned to these functions on the basis of quantum of services rendered and then the share of the service departments should be re-apportioned to the production departments.

40. Loss on sale of machinery

Loss on sale of machinery may arise due to obsolescence or due to under-depreciation in the past. Loss arising due to obsolescence should be written off to costing Profit & Loss Account, but loss arising due to under-depreciation should be treated as carry forward of loss and hence should be included in works overhead of the period or of a number of periods to come.

41. Profit on sale of depreciable assets

Profit, under this head, may arise due to over-depreciation in the past or due to rise in market price. Profit to the extent of the difference between the written down value and the original cost should be included in cost by crediting to works overhead account of the period or of a number of periods to come, but profit beyond this limit should be treated as capital profit to be excluded from cost.

Let the original cost is Rs. 50,000, the written down value is Rs. 40,000 and the selling price is Rs. 65,000. The profit is Rs. 25,000. Profit to be included in cost is Rs. (50,000 - 40,000) or Rs. 10,000. Profit to be excluded from cost is Rs. (25,000 - 10,000) or Rs. 15,000.

42. Cost of patterns and dies

Patterns and dies may be prepared for a particular job. In this case the entire cost is charged directly to the job account. If the patterns and dies are scrapped subsequently, the value realised may be credited to the job account. When the patterns and dies can be used in other jobs with or without minor changes, the cost should be apportioned to jobs using them.

43. Interest on capital

This item of expense is a controversial one. Some accountants suggest that this is purely a financial cost and has got nothing to do in Cost Accounts. Others contend that, like other factor prices, interest on capital should also be treated as an element of cost. The arguments for and against inclusion of interest in cost are as follow :

Arguments for inclusion :

(i) As rent is paid for the use of the accommodation, interest is paid for the use of capital. If rent is included in cost why interest should be excluded ?

(ii) Comparison of cost in two organisations cannot be dependable unless interest is considered in both.

(iii) If interest is excluded from cost, time element is ignored ; but time element is an important cosideration in production. If a person purchases logs of timber and immediately manufactures some furniture, he gets a price which is definitely lower than the price received by another person who purchases logs of timber, *seasons the same* over a few months and then manufactures furniture for sale. The latter person only loses interest on capital blocked for the months concerned. So, unless interest is included in cost his exact profit cannot be ascertained.

(iv) What difference we notice between an organisation employing cheap machinery and implements and an organisation employing very costly machinery and implements, other things remaining equal, unless we consider interest on capital in cost accounts ?

(v) When an organisation produces both cheap articles and costly articles involving smaller and larger investments respectively, inclusion of interest in cost is of significant importance.

Arguments against inclusion :

(i) Interest is a matter of internal finance and hence is not connected with cost of production.

(ii) Interest is paid on borrowed capital. No interest is payable on proprietor's own capital. Since it is difficult to decide as to whether interest on borrowed capital or interest on entire capital should be considered for cost accounts, it is better to exclude the item altogether.

(iii) If interest is considered in respect of all investments in fixed as well as current assets, the matter becomes very complicated.

(iv) Where the capital is owned and no interest is payable, interest is automatically excluded ; but in order to facilitate comparison, interest paid on borrowed capital, as well, should be excluded.

(v) Rates of interest may vary according to the extent of security offered, guarantee provided etc. Comparison of costs of two organisations does not become dependable if interest is included in costs and rates of such interest vary widely.

In view of the above arguments for and against, it may be concluded that—(i) in order to avoid complications interest may be excluded ; (ii) where time factor in production decides sales revenue, interest may be included in cost accounts and in that case also, interest on capital, whether owned or borrowed, invested in *fixed assets only* should be considered.

44. Depreciation

Diminution in the value of any fixed asset due to its use and/or lapse of time may be termed as *depreciation.* Every asset has a definite life in

terms of working hours. So, if any asset is used extra shift or overtime during any period, the amount of diminution shall also be higher. If an asset is not used at all, during a particular period, it will lose its value due to lapse of time.

Thus, the incidence of depreciation is automatic, irrespective of the extent of use, although the amount of depreciation involved may vary.

Depreciation on assets is charged to cost of production in cost accounts ; because it represents the cost of use of the asset and it enables to make sufficient profit for replacement of the assets after their lives.

Although there are a number of methods of providing for depreciation, each having its own merits and demerits (like, straight line method, reducing balance method, production unit method, production hour method, annuity method, insurance policy method, sinking fund method, sum of digits method, revaluation method etc.), our intention is not to discuss the methods here, because we are to read them in our books on financial accounting. What we should discuss here is that, a register should be maintained to record the amount of depreciation provided every year, in respect of every asset. All necessary details are recorded in the register, a specimen of which is given below :

Plant & Machinery Register

Name of the Machine.........   Date of acquisition.........   Price.........
Ref. No.........   Date of installation......... Installation cost.........
Location.........   Maker.........   Scrap value (estimated)......
                                Supplier......   Rate of Depreciation.........

Date	Particulars	Amount Rs.	Depreciation Rs.	Balance Rs.	Repairs Rs.	Remarks

Sometimes it is observed that although the entire value of an asset has been written off by way of depreciation, the asset is still giving normal service. This asset is often called *life expired asset*. Why this happens ? Causes may be any one or more of the following :

(a) Charging depreciation at a rate hire than it should have been.
(b) Wrong assessment of the working life of the asset.
(c) Extra efficient maintenance leading to prolonged life.
(d) Use of the asset beyond its estimated life (may be, inspite of lower working ability) due to difficulty of replacement.

Since the asset renders service for production, depreciation should be charged to *the cost of products* making the use of the asset, inspite of the fact that the asset stands at *nil value*. Unless depreciation on *life expired asset* in use is considered in cost, the cost of products making the use of

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the asset shall be understated and will not be comparable with the corresponding cost of the previous periods. In case of life expired asset in use, the second life is estimated and revaluation is done. With the value arrived at, the Asset Account is debited and Capital Reserve Account is credited.

Rates of depreciation : Rates of depreciation offer another important aspect of our present discussion. There are different rates worked out for providing depreciation :

- (*a*)   Single rate for each individual asset
- (*b*)   Composite rate for a number of assets
- (*c*)   Group rate for a group of assets of similar type
- (*d*)   Accelerated rate to adjust for extra shift or overtime work.

Single rate is calculated taking into consideration the life and cost of an individual asset. This method creates difficulty if there are numerous assets.

Composite rate is obtained by dividing the aggregate of the depreciation charge for all assets (calculated in whatever method) during a period by the aggregate of the cost of those assets. The rate can be expressed as a percentage. When all the assets are used in each job, the composite rate is suitably applied.

Group rate is similar to composite rate. Composite rate for assets belonging to each group may be called group rate. In case of composite rate, only one rate prevails in the factory or shop, but in case of group rate, several composite rates depending upon the number of groups may prevail.

Accelerated rate is obtained by augmenting the normal depreciation rate by multiplying the same by *activity factor* in order to provide for higher depreciation for higher duration of work. Let, under straight line method, the normal rate of depreciation of an asset is Rs. 400 p.m., the budgeted output for the month is 1,000 units and the actual output is 1,200 units in the month.

The activity factor is $\frac{1,200}{1,000} \times 100$ or 120%.

The accelerated rate of depreciation is, therefore, Rs. $400 \times \frac{120}{100}$

or Rs. 480 for the month.

EXERCISES

Theoretical :

1.   Explain the term 'overhead' used for the purpose of cost accounts. What are its usual sub-divisions ? Briefly describe the nature of items covered by these sub-divisions.   (*C. U., B. Com. Hons.*)

2.   Define 'overhead'. What are the broad heads under which the various items of overhead expenses can be grouped ?

3. Give 4 examples of each of the following categories of expenses : (a) Works overhead, (b) Office and Administration overhead, (c) Selling overhead, (d) Distribution overhead.

4. Name four items for each of the undernoted categories of expenses for the purposes of a factory's cost accounts : (a) Works overhead. (b) Office and Administration overhead, (c) Selling and distribution overhead. (*C. U., B. Com. Hons.*)

5. State what you understand by the following terms used in a costing system : (a) allocation ; (b) apportionment ; (c) absorption.

6. What do you understand by the terms 'Selling overhead' and 'Distribution overhead' ? Give four examples of each. How are selling overhead allocated to products ?

7. What is an overhead ? State the classifications of overheads and the basis of their usual apportionment. (*Gauhati University, B. Com.*)

8. Distinguish between : Factory overheads, Selling and Distribution overheads, Administration overheads. Suggest a method for absorbing each type of overhead in cost.

9. What do you mean by 'Administration Overhead' ? Give six examples. How are administration overheads allocated to the products.

10. State with illustrations what you understand by the following : (a) Fixed overhead, (b) Variable overhead, (c) Semi-variable overhead.

(*C. U., B. Com. Pass '85*)

11. What advantages are derived by classification of overheads as variable and fixed ?

12. What do you understand by classification, allocation, and apportionment in relation to overhead expenses ? Explain fully.

13. What do you mean by overhead ? Discuss the different methods of recovering Factory overhead. (*C. U., B. Com. Pass '85*)

14. Describe the various methods of absorption of factory overhead. Which of the methods do you consider most scientific and why ? (*C. U., B. Com. Hons. '85*)

15. Explain the various bases of apportionment of overheads to departments with illustration as to the items of expenses.

16. What are the methods of distribution of service department overheads to production departments. Mention any two methods.

17. Discuss the merits and demerits of different methods of absorbing factory overheads.

18. What do you mean by machine hour rate ? How is it computed ?

19. What is a 'labour hour rate' ? How it is ascertained ? In what respects it differs from a 'machine hour rate' ?

20. What do you understand by under- and over-absorption of overheads ? When do they arise ? State how do you deal with them in Cost Accounts.

21. How will you deal with the undernoted items in Cost Accounts :
(a) Carriage inward on materials purchased. (b) Carriage outward on articles sold. (c) Works canteen and welfare expenses. (d) Spoiled units sold as scrap. (e) Royalty payments. (f) Handling expenses of materials and stores. (g) Defective units corrected by use of extra labour. (h) Fines recovered from workers. (*C. U., B. Com. Hons.*)

22. How will you deal with the undernoted items in Cost Accounts.
(a) Works Manager's salary. (b) Normal wastage of material. (c) Hire of accounting machines. (d) Bad debts. (e) Packaging Charges. (f) Canteen Expenses. (*C. U., B. Com. Hons.*)

23. How would you deal with the following expenses in your Cost Accounts ?
(a) Cost of patents. (b) Loss of stores. (c) Idle time. (d) Retrenchment

compensation. (e) Interest on capital borrowed. (f) Technical Director's fee. (g) Loss on sale of machinery. (h) Bad debts. *(C. U., B. Com. Hons.)*

24. How would you allocate the following expenses in your Cost Accounts ?

(a) Cost of patterns and dies. (b) Charges incurred for maintaining a canteen in a manufacturing concern. (c) Premium paid for workmen's compensation insurance. (d) Cost of defective work which requires replacement. (e) Research expenditure. (f) Loss of stores. (g) Repairs to machinery. (h) Technical Director's fee. *(C. U., B. Com. Hons.)*

25. Give arguments for or against the inclusion of the following items in Cost Accounts : (a) Directors' fees. (b) Profits made on the sale of depreciable assets. (c) Bad debts. (d) Interest on capital *(C. U., B. Com. Hons.)*

Practical

1. The Production Department of a Factory furnishes the following information for the month of October :

Materials used	Rs. 54,000
Direct wages	Rs. 45,000
Labour hours worked	36,000
Hours of machine operation	30,000
Overheads chargeable to the department	Rs. 36,000

For an order executed by the department during the period, the relevant information was as under :

Materials used	Rs. 6,000
Direct wages	Rs. 3,200
Labour hours worked	3,200
Hours of machine operation	2,400

Calculate the overhead chargeable to the job by the following methods :

(i) Direct material cost percentage rate,

(ii) Labour hour rate, and

(iii) Machine hour rate.

2. From the following budgeted figures of Mysore Metal Works

(i) Prepare normal overhead application rates using :

    (a) Direct Labour-Hour method ;

    (b) Direct Labour-Cost method ; and

    (c) Machine Hour Rate method.

Budgeted figures

Estimated factory overhead for the year	Rs. 58,000
Estimated direct labour hours for the year	1,34,600
Estimated direct labour cost for the year	Rs. 97,000
Estimated Machine Hours	50,500

(ii) Prepare a comparative statement of cost showing the results of application of each of the above rates to Job No. 47 from the data given below :

Cost of direct materials consumed	Rs. 42
Direct labour wages	Rs. 45
Direct labour hours	30
Machine hours	20

(iii) Indicate. giving reasons, what method of overhead recovery should be preferred.

3. You are given the following information relating to Job 105 which is to be processed in a machine shop :

	Previous period	*Job 105*
Value of materials consumed	Rs. 66,000	Rs. 145
Direct labour cost	Rs. 99,000	Rs. 220
Direct labour hours	8,250	14
Machine hours	11,000	15
Units produced	495	1
Overheads	Rs. 39.600	(?) to be added

You are required to :

(a) calculate four possible prices to be quoted for Job 105, assuming a profit margin of 33⅓% on sale price, and using different methods of overhead recovery.

(b) Comment briefly on the merits of each method you have used.

4. The following is the budget of BTS Engineering Works for the year, 1982 :

Factory Overheads	Rs. 62,000	Direct Labour Hours	1,55,000
Direct Labour Cost	Rs. 98,000	Machine Hours	50,000

(a) From the above figures prepare the overhead application rates, using the following methods :

(i) Direct Labour Hour ; (ii) Direct Labour Cost ; (iii) Machine Hour.

(b) Prepare a comparative statement of cost, showing the result of application of each of the above rates to Job Order 444 from the under-mentioned data :

Direct Material Cost Rs. 45	Direct Labour hours 40
Direct Labour Rs. 50	Machine Hours 30

(c) Briefly describe under what circumstances each of the above methods of overhead recovery would be suitable.

5. Savana Printing Co. has three operating departments : No. 1 Printing and Binding ; No. 2 Lithographing and No. 3 Engraving. The company has a job order cost system using a single predetermined expense rate. The management has been made aware of the deficiencies of using such a rate and is now interested in departmentalizing factory overhead.

A study reveals that, Department No. 1 has 8 similar machines representing a large investment and calling for high repairs and depreciation charges. In Department No. 2 all the workers perform similar tasks and are, therefore, paid the same hourly wage. Department No. 3, however, has several classes of workers, each group being paid a different rate per hour.

The estimated factory overhead, production data and costs are as follows :

	Printing & Binding	Lithographing	Engraving
Factory overhead	Rs. 40,000	Rs. 68,750	Rs. 1,20,000
Direct labour hours	10,000	20,000	40,000
Direct labour cost	Rs. 25,000	Rs. 55,000	Rs. 80,000
Machine hours	20,000	Nil	Nil

Prepare—(1) An analysis to advise management regarding the types of rates to be used in these departments. (2) A computation of the rates recommended.

6. A company makes two products—*X* and *Y*. The total budget for overheads in the next year is Rs. 60,000. Other budget costs and details are :

	X		Y
Units of production	10,000		5,000
Prime cost per unit			
Material			
3|4 kg. of A at Rs. 2 per kg.	Rs. 1·50	1|2 kg. of B at Rs. 3·60 per kg.	Rs. 1·80
Labour			
24 minutes at Rs. 1·50 per hr.	0·60	24 minutes at Rs. 5 per hr.	2·00
Total Prime Cost	Rs. 2·10		Rs. 3·80

You are required to :

(*a*) calculate four different overhead recovery rates :

(*b*) show, for one unit of *X* and one unit of *Y*, the overhead and total cost under each of the four methods.

7. A company plans to manufacture two products, 800 units of *P* and 1,500 units of *Q*, in the next period of account. The total cost of factory overhead is estimated at Rs. 1,83,400. The unit cost of direct materials amounts to Rs. 6·70 for *P* and Rs. 7·40 for *Q*, and direct labour cost is expected to be Rs. 16·80 for *P* and Rs. 15 for *Q*. Direct labour hours for each product has been calculated at 7 hours for *P* and 5 hours for *Q*, and these times include machine time of 5 hours and 3 hours respectively.

For each product, you are required to calculate the factory cost per unit, by using three different methods of absorbing factory overheads.

8. The following figures have been extracted from the books of a manufacturing concern. All jobs pass through the company's two departments of which the details are as below :

	Prod. Deptt.	Finishing Deptt.
Materials used	Rs. 6,000	Rs. 500
Direct labour	Rs. 3,000	Rs. 1,500
Factory overheads	Rs. 1,800	Rs. 1,200
Direct labour hours	12,000	5,000
Machine hours	10,000	2,000

The following information relates to work order No. 526 :

	Prod. Deptt.	*Finishing Deptt.*
Material used	Rs. 240	Rs. 20
Direct labour	Rs. 130	Rs. 50
Direct labour hours	530	140
Machine hours	510	50

You are required :

(*a*) to enumerate 4 methods of absorbing factory overheads by work orders, showing the rates for each department under the methods quoted ; and

(*b*) to prepare a statement showing the different cost results for work order No. 526 under each of the 4 methods you refer to.

9. Navana Industries undertakes three different jobs *P*, *Q* and *R*. All of them require the use of a special machine and also the use of a computer. The computer is hired and the hire charges work out to Rs. 4,20,000 per annum. The expenses regarding the machine are estimated as follows :

	Rs.
Rent for the quarter	17,500
Depreciation per annum :	2,00,000
Indirect charges per annum	1,50,000

During the first month of operation the following details were taken from the job register :

Job	*P*	*Q*	*R*
No. of hours the machine was used :			
(a) without the use of computer	600	900	—
(b) with the use of computer	400	600	1,000

You are required to compute :

(a) the machine hour rate for the month when the computer was used and when the computer was not used ; and

(b) the amount of overheads chargeable to the individual jobs *P*, *Q* and *R*.

10. AB Ltd. absorbs its production overhead by using predetermined rates—a percentage on direct labour cost for product *A* and a machine hour rate (calculated to three decimal places) for product *B*.

The estimates made at the beginning of the financial year which ended on 31st October were as follows :

	Deptt. A Rs.	*Deptt. B* Rs.
Direct labour cost	4,50,000	1,50,000
Production overhead	5,17,500	9,22,500
	hours	*hours*
Direct labour	1,72,500	40,000
Machines	20,000	1,80,000

For the month of October, the cost sheet for Job. No. 252 shows the following information :

	Deptt. A	Deptt. B
Materials used	Rs. 200	Rs. 800
Direct labour	Rs. 360	Rs. 190
Direct labour hours	120	47·50
Machine hours	20	260

At the end of the financial year it was ascertained that actual production overhead incurred by Department *A* was Rs. 5,55,000 and that incurred by Department *B* was Rs. 9,00,000.

You are required to :

(*a*) calculate the overhead absorption rates for each of the departments *A* and *B* ;

(*b*) determine the total production overhead cost to be charged to Job No. 252 for October ;

(*c*) show the over/under absorbed overhead for each department and for the company as a whole for the year ended 31st October, assuming that actual direct labour cost and machine hours worked were as originally estimated ;

(*d*) comment on the choice of the overhead absorption rate based on direct labour cost for Department *A*.

11. The following expenses have been incurred for the year, 1981, in respect of departments *X* and *Y* of a factory :

	Deptt. X	Deptt. Y
	Rs.	Rs.
Rent and rates	5,000	7,000
Lighting	2.600	3,000
Supervisor's salary	9,000	10,000
Sundries	1,640	2,230

There are 20 operators in Department *X* and 25 operators in Department *Y*. The departments work for 300 days in a year and the number of hours worked in a day is 8. Out of the total number of days 5% is to be treated as idle time.

The power is charged @ 20 paise per hour and tool depreciation @ 15 paise per hour in both the departments.

You are required to calculate the Direct Labour Hour rate from the above information and also to find out the production cost of work order No. 259 when the material cost is Rs. 70 and the direct wages booked in the job cards are 6 hours at Rs. 1·20 per hour in Department *X* and 4 hours at Rs. 1·50 in Department *Y*.

12. The factory overhead costs of four production departments of a company engaged in executing job orders, for an accounting year, are as follows :

		Rs.
Deptt.	A	19,300
	B	4,200
	C	4,000
	D	2,000

Overhead has been applied as under :

Deptt.	A	Rs. 1·50 per Machine Hour for 14,000 hours
	B	Rs. 1·30 per Direct Labour Hour for 3,000 hours
	C	80% of Direct Labour cost of Rs. 6,000
	D	Rs. 2 per piece, for 950 pieces

Find out the amount of, under- or over-absorbed factory overheads departmentwise.

What are the methods that could be considered for disposal of the resultant under- or over-absorbed factory overheads ?

13. A Manufacturing concern absorbs overheads by means of budgeted departmental rates which are as follows :

Production Departments	*Absorption*
Machine Shop	Rs. 1·20 per machine hour worked
Finishing Shop	80% on direct wages
Assembly	Re. 0·25 per unit of finished product
Non-productive Departments	125% on direct material cost, issued to production

For the previous period the following was incurred :

	Direct Materials Issued Rs.	Direct Wage Earned Rs.	Machine Hours Worked	Actual Overhead Rs.
Machine Shop	4,160	6,650	9,600	11,570
Finishing Shop	23,520	12,700	— —	9,470
Assembly	11,020	3,700		15,110
Non-productive Deptts.				49,135
	38,700	23,050		85,285

During the period 58,500 units were manufactured.

You are required to :

(*a*) Calculate for each department and in total—

    (*i*) the amount of overhead absorbed into total costs ;

    (*ii*) the amount of under- or over-absorbed overhead.

(*b*) Calculate the amount of profit or loss made by Job No. 156 which was completed during the period from the following information :

Selling price Rs. 3 per unit ; Quantity 1,152 units

	Materials Rs.	*Wages* Rs.	*Machine hours*
Machine	150	101	315
Finishing shop	470	200	
Assembly	160	74	

14. In a factory there are four distinct groups of machines. You are required to apportion the following common overhead expenses on the basis of information given below. State clearly the basis of apportionment.

Overhead expenses :

	Rs.
Power	10,700
Rent and Rates	32,000
Lighting	5,000
Insurance of factory building	3,600
Insurance of machinery	7,200
Depreciation of machinery	36,000
Supervision charges	25,000

Other information :

	A	B	C	D
Horse power hours ratio	25	35	30	10
Space occupied (sq. ft.)	800	600	400	200
Book value of machinery (Rs.)	40,000	60,000	30,000	70,000
Light points of equal wattage (Nos.)	50	30	20	25
Time devoted for supervision	20%	30%	25%	25%

15. Alpha Engineering Company has three production departments A, B and C. From the following particulars calculate Labour Hour Rate of A, B & C departments.

Expenses relating to a month :

	Rs.		Rs.
Power	3,600	Depreciation on machinery	6,400
Rent	7,000	Electricity	2,500
Indirect wages	3,800		

Further information :

	Deptt. A	Deptt. B	Deptt. C
Floor space (sq. metre)	1,000	2,000	500
Cost of machine (Rs.)	40,000	30,000	10,000
Light points (Nos.)	12	12	6
No. of workers	10	8	4
Direct wages (Rs.)	10,000	6,000	3,000
Horse power hour ratio	3	2	1

There were 25 working days of 8 hours each in the month.

(*C. U., B. Com. Pass, 1985*)

16. A department is having 3 machines. The figures indicate the departmental expenses. Calculate the machine hour rate in respect of each of these machines from the information given below :

	Rs.
Depreciation of Machinery	12,000
„ of Building	2,880
Repairs to Machinery	4,000
Insurance of Machinery	800
Indirect Wages	6,000
Power	6,000
Lighting	800
Miscellaneous Expenditure	4,200
Total	**36,680**

	Machine No. 1	Machine No. 2	Machine No 3
Direct wages	Rs. 1,200	Rs. 2,400	Rs. 2,400
Power units	30,000	10,000	20,000
Number of workers	4	8	8
Light points	8	24	48
Space	400 sq. ft.	800 sq. ft.	800 sq. ft.
Cost of machines	Rs. 3,00,000	Rs. 1,20,000	Rs. 1,80,000
Hours worked	200	300	300

17. The following figures relate to a department having three machines *A, B* and *C.* Compute the machine hour rate of machine *A* from the data given below ; the machine *A* is expected to work 200 hours.

	Rs.
Power	1,500
Lighting	200
Depreciation of machinery	3,000
Insurance on machinery	200
Indirect wages	1,500
First Aid Post	50
Civil Maintenance	720
Repairs to Machinery	1,000
Miscellaneous expenditure	1,000
	Rs. 9,170

	A	B	C
Space occupied	100 sq. ft.	200 sq. ft.	200 sq. ft
Light points (Nos.)	2	6	12
Cost of machine	Rs. 75,000	Rs. 30,000	Rs. 45,000
Number of workers	1	2	2
Power units recorded	7,500	2,500	5,000
Direct wages	Rs. 300	Rs. 600	Rs. 600

(I. C. W. A. Inter.)

18. The Machine shop of an Auto-Engineering factory has five distinct groups of machines for which the recovery of expenses is at a rate per machine hour.

A budget for the machine shop for the year ended 31-12-83 is framed as under :

Groups :	1	2	3	4	5
Consumable stores (Rs.)	210	420	700	850	1,200
Maintenance (Rs.)	630	840	1,500	2,000	1,800
Horse power hours ratio	5	15	20	25	35
Space occupied (sq. ft.)	200	400	600	300	500
Book value of machinery (Rs.)	30,000	90,000	25,000	60,000	45,000
Estimated utilisation hours	5,000	10,000	3,000	7,500	12,500

Common expenses are :

	Rs.
Power	9,000
Rent, rates and taxes	25,000
Heat and light	5,500
Insurance on building	2,400
Insurance on machinery	7,500
Depreciation	37,500
Shop supervision	30,400
Other general expenses	60,800
Total	**1,78,100**

Calculate a machine hour rate for each group indicating the basis of apportionment of expenses.

19. A factory has two Production Departments and one Service Department. The Service Department (*X*) renders services to Production Departments (*A* and *B*) in the ratio of 3 : 2. The particulars of the Departments and the details of expenses are given below. Determine the amounts of factory overheads chargeable to the Production Departments.

	Rs.
Rent and Rates	5,200
Depreciation	45,000
Power	3,500
Electricity	1,200
Canteen Expenses	11,000
Insurance	2,600

	A	B	X
Wages (Rs.)	30,000	20,000	5,000
H. P. of machines	200	100	50
No. of Light and Fan Points	40	30	10
Floor Space (sq. metre)	400	200	50
Fixed Assets (Rs. in lakh)	5	3	1
Total Assets (Rs. in lakh)	7	4	2

20. In a certain factory, there are two Production Departments *X* and *Y*, two Service Departments *A* and *B*. Total expenses of the service department *A* are apportioned between *X*, *Y* and *B* in the ratio 3 : 2 : 1, and the expenses of the service department *B* are allocated between *X* and *Y* equally. From the following particulars calculate the overheads to be allocated to Production Departments *X* and *Y* :

	X	Y	A	B
Floor Space (Sq. ft.)	5,000	4,000	1,000	2,000
Assets (Rs. in lakh)	10	5	3	1
H.P. of Machine	100	50	40	10
No. of Workers	100	50	50	25
Light points	25	15	10	10
Direct Wages (Rs.)	10,000	8,000	5,000	3,000
Direct Materials (Rs.)	15,000	10,000	4,000	—

Total expenses and charges are :

	Rs.
Depreciation	38,000
Rent, Rates and Taxes	18,000
Power	12,500
Insurance on Assets	9,500
Canteen Expenses	5,400
Electricity	3,600

(C. U., B. Com. Hons. '88)

21. The following information is available for 3 months ending on 31-3-1980 of a large manufacturing concern. You are required to calculate the departmental overhead rates for each Production Department, assuming that the overheads are recovered as a percentage of direct wages.

The expenses for 3 months :   Rent and Rates—Rs. 5,000 ; Repairs and Maintenance—Rs. 6,000 ; Depreciation—Rs. 30,000 ; Electricity Charges—Rs. 2,000 ; Power—Rs. 12,000 ; Supervision Expenses—Rs. 3,000 ; General Expenses—Rs. 1,500.

	Production Departments			Service Departments	
	A	B	C	D	E
Direct wages (Rs.)	12,000	8,000	5,000	3,000	2,000
Floor space (sq. ft.)	8,000	6,000	4,000	4,000	3,000
Value of Machines (Rs.)	1,00,000	80,000	60,000	40,000	20,000
Horse Power of Machines	50	30	20	20	—
No. of Light Points	80	40	40	30	10

Total expenses of Service Department *E* are to be distributed equally and those of Service Department *D* are to be distributed in the ratio of 2 : 2 : 1 over the Production Departments *A, B* and *C.*

<div align="right">(<i>C. U., B. Com. Hons.</i> '80)</div>

22. Moonlight Engineering Company has three production departments, *A, B* and *C* and one service department *S.*

Following are the particulars of a month of 25 working days of 8 hours each. Calculate the labour hour rate for each of the production departments :

Indirect Material	Rs.	Rs.
Deptt. A	1,735	
Deptt. B	930	
Deptt. C	935	
Deptt. S	300	
		3,900
Indirect Wages		9,000
Rent		8,800
Canteen Expenses		1,800
Lighting		2,200
Depreciation @ 12% p.a.		

Other information :

	Deptt. A	*Deptt. B*	*Deptt. C*	*Deptt. S*
No. of Workers	20	25	30	15
Area (Sq. metre)	100	100	150	50
Direct Wages (Rs.)	8,000	10,000	12,000	6,000
No. of Electric points	40	30	20	20
Value of Assets (Rs.)	5,000	6,000	6,000	3,000

Services rendered by the service department *S* to production departments *A, B* and *C* is in the ratio of 2 : 2 : 1 respectively.

<div align="right">(<i>C. U., B. Com. Hons.</i> '86)</div>

23. The following figures are extracted from the accounts of Calcutta Manufacturing Co. for the month of January, 1984 :

Indirect Materials :		Rs.
Production Departments	P_1	280
Do	P_2	140
Service Departments	S_1	270
Do	S_2	350
Indirect Wages :		
	P_1	324
	P_2	312
	S_1	296
	S_2	190
Power and light		3,000
Supervision charges		2,200
Rent and Rates		500
Insurance on assets		60
Depreciation @ 12% per annum.		

From the above information and the following data prepare overhead recovery rates for the production departments P_1 and P_2, on the basis of labour-hours. The expenses of service departments should be apportioned in the ratio of—S_1 in 10 : 3 and S_2 in 3 : 2 to production departments P_1 and P_2 respectively.

	P_1	P_2	S_1	S_2
Area (Sq. Metres)	400	200	100	200
Value of assets (Rs.)	8,000	4,000	7,000	5,000
Electricity (kwh.)	4,000	3,000	1,000	1,000
Number of employees	150	100	75	100
Labour hours	5,000	4,000	—	—

(C. U., B. Com. Hons '84)

24. A firm using a system of job costing has the following Production and Service Departments with primary distribution of costs.

	Production Departments				Service Departments	
	A	B	C	D	X	Y
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Overheads	16,000	22,000	24,000	10,000	18,000	16,000

Service Department overheads are distributed over the other departments in the following proportions :

Department X :	To Department	A	25%
		B	45%
		C	20%
		D	10%
Department Y :	To Department	A	15%
		B	50%
		D	35%

Production Departments *A* and *B* use an overhead rate per direct labour hour for job costing purposes, while Production Departments *C* and *D* use a machine hour rate.

The appropriate information for these purposes are as follows :

	A	*B*	*C*	*D*
Direct Labour Hours	6,000	12,000	6,000	4,000
Machine Hours	3,000	5,000	4,500	5,000

Calculate the overhead rate for each of the four Production Departments correct to two decimal places.

25. BPS Ltd. is a manufacturing company having two Production Departments *X* and *Y* and two Service Departments *A* and *B*. *A* renders service worth Rs. 12,000 to *B* and the balance to *X* and *Y* as 3 : 2. *B* renders service to *X* and *Y* as 9 : 1.

	X	*Y*	*A*	*B*
Direct wages (Rs. in lakh)	0·60	0·30	0·20	0·15
Floor space (sq. ft.)	5,000	4,000	1,000	2,000
Assets (Rs. in lakh)	10	5	3	1
H.P. of machines	100	50	4.5	10
Machine hours	2,000	3,000	1,000	1,000
Number of workers	100	50	50	25
Light and Fan points (Nos.)	50	30	20	20

penses and charges are :

	Rs.
Depreciation	1,90,000
Rent, rates and taxes	36 000
Insurance	15,200
Power	20,000
Canteen expenses	10,800
Electricity	4,800
General overheads	6,300

Prepare a statement showing the distribution of overheads to the various production departments on the most equitable basis. Also compute machine hour rates of the production departments *X* and *Y*.

26. The following data was obtained from the books of a Light Engineering Company for the half year ended 30th September, 1984. Calculate the departmental overhead rate for each of the Production Departments assuming that the overheads are recovered as a percentage of Direct Wages :

		Production Departments			Service Departments	
		A	*B*	*C*	*X*	*Y*
Direct Wages	Rs.	7,000	6,000	5,000	1,000	1,000
Direct Materials	Rs.	3,000	2,500	2,000	1,500	1,000
Employees	Nos.	200	150	150	50	50
Electricity	kwh	8,000	6,000	6,000	2,000	3,000
Light points	Nos.	10	15	15	5	5
Assets value	Rs.	50,000	30,000	20,000	10,000	10,000
Area occupied	Sq. yds.	800	600	600	200	200

The expenses for 6 months were :

	Rs.
Stores overheads	400
Motive power	1,500
Electric lighting	200
Labour welfare	3,000
Depreciation	6,000
Repairs & Maintenance	1,200
General overheads	10,000
Rent & Taxes	600

Apportion the expenses of Department X in the ratio of 4 : 3 : 3 and that of Department Y in proportion to Direct Wages, to Departments A, B and C respectively.

27. The budgeted indirect factory costs have been estimated as follows :

	Rs.
Indirect Wages	3.300
Power	4,800
Light and Heat	1,600
Repairs and Maintenance	2,800
General Expenses	1,800
Depreciation of Machinery	2,400
	16,700

The factory has two production departments A and B and a service department S. The above indirect costs are to be allocated to departments using the following bases for calculations :

	A	B	S
Floor space in square feet	12,000	18,000	10,000
Power rating of machinery.	0·5 kv	6·0 kv	1·5 kv
Value of machinery	Rs. 1,000	Rs. 9,800	Rs. 1,200
From last cost period :			
Indirect wages	375 hrs.	375 hrs.	1,500 hrs.
Repairs etc.	Rs. 400	Rs. 600	Rs. 400
General expenses	Rs. 300	Rs. 500	Rs. 100
Work done by S on machinery of A and B	40%	60%	

28. The budget also estimates that the following hours will be used on production in the budget period :

	A	B
Man-hours	24,130	10,000
Machine-hours	1,000	8,000

It is decided that the indirect expenses for A will be allocated to jobs on a man-hour basis and for B on a machine-hour basis.

Required :

(1) Work out indirect expense rates for departments A and B.

(2) If the wages rates for A were Re. 0·90 per hour and for B Rs. 1·30 per hour, work out the factory cost of a job whose cost figures are recorded as follows :

	A	B
Materials	Rs. 120	Rs. 60
Man-hours	120	20
Machine-hours	10	60

29. A manufacturing company consists of three Production Departments : Turning, Milling and Grinding. Maintenance is done by the departments themselves. There are four Service Departments : Stores, Planning, Canteen and Time Office. For the month of September, 1989, the direct departmental expenses were as follows :

Turning	Rs. 24,000	Stores	Rs. 12,000
Milling	Rs. 28,000	Planning	Rs. 20,000
Grinding	Rs. 36,000	Canteen	Rs. 16,000
		Time Office	Rs. 4,000

The expenses of stores are to be distributed on a percentage basis, viz., 20%, 40% and 40% to Turning, Milling and Grinding Departments respectively. The expenses of the Planning Departments are to be distributed according to the machine-hours in Production Departments and those of the Canteen and Time Office are to be distributed according to the number of men employed in the Production Departments.

Prepare a statement showing the distribution of the Service Departments' expenses to the Production Departments and determine also the final absorption rates.

For your information the following data are available :

Production Department	Turning	Milling	Grinding
No. of men employed	22	32	46
Machine-hours worked	10,000	15,000	25,000

30. The Super Filing Cabinet Company has three production departments : Machining, Assembling and Spraying, and two service departments : Internal Transport and Production Control. During 1987 the company plans to produce 5,000 filing cabinets. The estimated costs being :

Material	Direct	Rs. 75,000
	Internal transport	5,000
Labour	Machining :	
	20,000 hrs. at Re. 0·60	
	5,000 hrs. at Re. 0·50	
	Assembling :	
	10,000 hrs. at Re. 0·60	
	10,000 hrs. at Re. 0·50	
	10,000 hrs. at Re. 0·40	
	Spraying :	
	8,000 hrs. at Re. 0·50	
	2,000 hrs. at Re. 0·40	
	Internal Transport	3,000
	Production Control	6,000
Other allocated costs :		
	Machine shop	11,000
	Assembly shop	9,360
	Spray shop	4,020
	Internal transport	2,000
	Production Control	2,000

On the basis of the estimated benefit received, the service department's costs are apportioned as follows :

Internal Transport

Machine shop 60%, Assembly shop 30%, Spray shop 10%

Production Control

Machine shop 30%, Assembly shop 30%, Spray shop 30%

Internal Transport 10%

You are required to :

(a) prepare a statement showing the overhead to be absorbed by each of the three production departments :

(b) briefly describe three methods by which overhead can be absorbed ;

(c) using the method you consider most appropriate, calculate the rate to be used for absorbing the machine shop overhead.

31. (a) In a factory with four production departments and two service departments, the operating costs for the month of October were as shown below. The cost of running the canteen is apportioned to each department on the basis of the estimated use of the canteen by the employees in each department. Similarly, the cost of the boiler house is apportioned on the basis of the estimated consumption of power used by each department. *

Cost for October were	Rs.
Production department	2.00,000
	5,00.000
	3,00,000
	4,00,000
Service department .	
Canteen	50,000
Boiler house	1,00,000
Total	Rs. 15 50.000

The service department expenses are apportioned as follows :

	Canteen %	Boiler House %
Production department : 1	10	20
2	30	10
3	20	30
4	30	20
Service department		
Canteen		20
Boiler house	10	--
	100	100

You are required to prepare a cost statement showing the costs of operating the four production departments after the costs of the service departments have been reapportioned to each production department.

(b) Comment briefly on the problems associated with apportioning service department costs to production departments.

32. A factory is having three production departments : *A*, *B* and *C*, and two service departments : Boiler-House and Pump-Room. The boiler-house has to depend upon the pump-room for supply of water and pump-room, in its turn, is dependent on the boiler-house for supply of steam power for driving the pump. The expenses incurred by the production departments during a period are : *A*—Rs. 8,00,000 ; *B*—Rs. 7,00,000 : and *C*—Rs. 5,00,000. The expenses for boiler-house is Rs. 2,34,000 and for the pump-room is Rs. 3,00,000.

The expenses of the boiler-house and pump-room are apportioned to the production departments on the following basis ·

	A	*B*	*C*	*Boiler-House*	*Pump-Room*
Expenses of boiler-house	20%	40%	30%	-	10%
Expenses of pump-room	40%	20%	20%	20%	—

Show clearly as to how the expenses of boiler-house and pump-room would be apportioned to *A*, *B* and *C* departments. Use algebraical equation.

33. The overhead allocated to the three production cost centres and two service cost centres of the manufacturing division of a company were :

		Rs.
Production cost centre :	*A*	20,000
	B	24,000
	C	36,000
Service cost centre :	*S*	13,500
	T	9,500

After a study it is decided that, the costs of the service cost centres should be apportioned as follows :

	Production cost centres			Service cost centres	
	A	*B*	*C*	*S*	*T*
	%	%	%	%	%
Service cost centre : *S*	Nil	55	35	—	10
T	45	35	15	5	—

You are required to calculate the total overhead chargeable to each production cost centre by each of the following methods :

(a) Ignoring the service given by service cost centres to each other ;

(b) using a 'two-step' method of apportionment whereby costs of the service cost centre that serves most cost centres is apportioned first, and that of the other service cost centre is then apportioned to the production cost centres ;

(c) using the 'repeated distribution' or 'continuous allotment' method of apportioning the costs of service cost centres among the production and the two service cost centres.

34. PK Ltd. manufactures various chemicals. It is organised into two manufacturing departments, blending and packaging with two ancillary sections devoted to materials handling and servicing.

Costs and production are monitored fortnightly, and the departmental budgets allow for overhead expenses of Rs. 20,000 on Blending and Rs. 12,000 on Packaging, assuming production and packaging of goods amounting to Rs. 48,000 at selling prices.

For the current period the ancillary section costs are to be allocated as follows :

Servicing	75% to Blending
	15% to Packaging
	10% to Materials Handling
Materials Handling	50% to Blending
	40% to Packaging
	10% to Servicing

Costs incurred in the fortnight to 8th July, 1985 were as follows :

	Blending	Packaging	Materials Handling	Servicing
	Rs.	Rs.	Rs.	Rs.
Labour	5,500	1,900	700	1,100
Materials	10,900	6,200	—	900
Other Overheads	2,500	2,000	500	500

Goods produced amounted to Rs. 52,000 at selling price, of which Rs. 44,000 was packaged.

You are required to allocate the expenses of the ancillary sections over the manufacturing departments and show the under- or over-absorption of costs on blending and packaging.

35. A manufacturing company has two production departments, viz., Machining and Assembly, and two service departments, viz., Tooling and Maintenance.

The budgeted monthly activity of the Machining Department is 400 machine-hours and the budgeted overhead cost is Rs. 16,000. The Assembly Department's overhead budget is Rs. 9,600 per month during which 2,400 direct labour-hours are expected to be worked.

In determining the overhead budgets of the production departments, the expenses of the service departments were dealt with as follows :

Tooling	70% to Machining
	20% to Assembly
	10% to Maintenance
Maintenance	50% to Machining
	30% to Assembly
	20% to Tooling

During May, 1986, the Machining Department booked 415 hours of machine time to production, and the Assembly Department booked 2,350 direct labour-hours.

he month was as follows :

	Machining	Assembly	Tooling	Maintenance
	Rs.	Rs.	Rs.	Rs.
Material	4.600	5,200	1,800	600
Labour	6,100	1,200	2,700	1,600
Miscellaneous	700	900	500	300

You are required to :

(a) prepare the overhead account for each production department showing the account of any over 'under absorption and its disposition ;

(b) identify the causes which gave rise to the over under absorption in each department, and state the amount attributable to each cause.

36. Shown below is an extract from next year's budget for a company manufacturing three different products in three production departments.

Product	P	Q	R
Production	4,000 units	3.000 units	6.000 units
Direct material cost	Rs. 7 per unit	Rs. 4 per unit	Rs. 9 per unit
Direct labour requirements :	hrs. per unit	hrs. per unit	hrs. per unit
Cutting department—			
Skilled operatives	3	5	2
Unskilled operatives	6	1	3
Machining department	1/2	1/4	1/3
Pressing department—	2	3	4
Machine-hour requirements :			
Machining department	2	1½	2½

The skilled operatives employed in the cutting department are paid Rs. 4 per hour and the unskilled operatives are paid Rs. 2·50 per hour. All the operatives in the machining and pressing departments are paid Rs. 3 per hour.

	Production departments			Service departments	
	Cutting	Machining	Pressing	Engineering	Personnel
Budgeted total overheads	Rs. 1,54,482	Rs. 64,316	Rs. 58,452	Rs. 56,000	Rs. 34,000
Service department costs are incurred for the benefit of other departments as follows :					
Engineering services	20%	45%	25%		10%
Personnel services	55%	10%	20%	15%	

The company operates a full absorption costing system.

You are required to calculate, as equitably as possible, the total budgeted manufacturing cost of :

(i) one completed unit of Product P, and

(ii) one incomplete unit of Product Q, which has been processed by the cutting and machining departments, but which has not yet been passed into the pressing department.

37. Calculate from the following data the machine hour-rate for machine 'A' :

Cost of the machine	Rs. 10,500
Estimated scrap value	Rs. 500
Effective working life	20,000 hours
Running time for four-weekly period	150 ,,
Weekly amount payable under a maintenance agreement covering all repairs	Rs. 25
Standing charges allocated to the machine per four-weekly period	Rs. 50
Power used by the machine	5 units per hour at a cost of 10 p. per unit

38. From the following information compute a machine hour rate in respect of Blow Moulding Machine for the month of October, 1989 :

Cost of Machine	Rs. 1,50,000
Estimated scrap value	Rs. 6,000
Effective working life	12,000 hours
Hours worked in the month	120 hours
Repairs estimated at	Rs. 12,000 over the effective working life

Standing charges allocated to the machine for the month are Rs. 480.

Power used by the machine is 20 units per hour at a cost of 20 paise per unit. Additional charge at 5 paise per unit is payable on the total units consumed, if the same exceed basic consumption of 2,000 units per month.

39. Compute the machine hour rate from the following particulars :

Cost of machine (Rs.)	13,700
Expected life (years)	10
Scrap value after 10 years (Rs.)	2,000
Working hours p.a. (hours)	1,800
Insurance p.a. (Rs.)	45
Cotton waste p.a. (Rs.)	75
Rent for department p.a. (Rs.)	975
Supervisor's salary p.a. (Rs.)	7,500
Lighting p.a. (Rs.)	36
Repairs for entire life (Rs.)	1,260
Power : 10 units @ 7½ paise per unit	

Machine occupies ¼th of the area of the department and the supervisor devotes ¼th of his time to the machine. The machine has two points out of the total twelve points for lighting in the department.

(C. U., B. Com. Pass)

40. From the following particulars calculate machine hour rate :

	Rs.
Cost of machine (including installation charges)	1,05,000
Rent of shop p.m.	1,000
Lighting of shop p.a.	1,500
Repairs p.a.	1,700
Supervisor's salary p.m.	1,200
Insurance premium of the machine per quarter	375

The life of the machine is 10 years with a scrap value of Rs. 5,000. It occupies ⅛th of the shop area and consumes 3 units of power per hour @ 33⅓ p. per unit. Supervisor devotes ⅓rd of his time to the machine. The machine has the capacity of working 5,000 hours p.a., but it actually works 90% of the capacity.

(C. U., B. Com. Hons.)

41. From the undernoted data calculate the machine hour rate of a Milling Machine :

Cost of Machine	Rs. 30.500
Scrap value	Rs. 2,500
Estimated life	12 years
Effective working days	200 days of 8 hrs.
	100 days of 6 hrs.
Maintenance and repairs	7·5% of capital cost
Stores consumed	Rs. 1,000
Supervision expenses	Rs. 7.500
Power consumption	Rs. 2 per operating hr.
Insurance premium	1% of capital cost
Idl· time estimated	10%

(C. U., B. Com. Hons.)

42. From the following particulars calculate the Machine Hour Rate for a machine purchased from Hindustan Machine Tools Ltd. ·

Cost of the machine	Rs. 60.000
Estimated working life	15 years of 1,800 hours each
Estimated scrap value	Rs. 6 000
Estimated repairs for the life	Rs. 13.500
Power consumed per hour	20 units at Re. 0·10 per unit
Insurance premium per annum	Rs. 420
Cotton waste, oil etc. per month	Rs. 28

The machine is installed in a department whose total monthly rent is Rs. 500. The machine occupies ⅕th space. Total lighting bill per month is Rs. 40 with a total of 10 points of which 3 are for this machine. The supervisor is paid a salary of Rs. 500 per month ; it is estimated that he devoted one-fourth of his time to this machine.

43. From the following details compute the hourly rate of a machine installed in a shop :

	Rs.
Cost of the machine	1,00,000
Installation charges	10,000
Estimated scrap value after the expiry of its life (15 years)	5,000
Rent and rates of the shop per annum	2,400
General lighting of the shop per month	300
Insurance premium for the machine per quarter	200
Estimated repairs and maintenance expenses per annum	1,000
Power consumption of the machine	10 units per hr.
Rate of power per 100 units	20
Estimated working hours of the machine per year	2,000
Shop supervisor's salary per month	600

The machine occupies ¼th of the total floor area of the shop. The supervisor is expected to devote ⅓th of his time for supervising the machine. General lighting expenses are to be apportioned on the basis of the floor area.   (*C. U., B. Com. Hons.*)

44. Chauhan owns a machine shop. From the following details compute the hourly rate of a machine newly installed for Rs. 24,000 in the shop :

	Rs.
Rent of the Shop	2,400 per year
Rates and water of the shop	1,200 per year
General Lighting and Heating	1,800 per year
Power consumption of the machine	4,800 per year
Supervisor's salary	600 per month
Estimated working hours of the machine	1,500 per year
Insurance premium of the machine	410 per year

The machine occupies ¼th of the total floor area of the shop. The supervisor is expected to devote ⅓th of his time for supervising the machine. General Light and Heating expenses are to be apportioned on the basis of the floor area. The life of the machine is 10 years without any scrap value.

45. The following particulars relate to a machine :

	Rs.
Purchase price of the machine	80,000
Installation expenses	20,000
Rent per quarter of the shop	3,000
General lighting for the total area	200 per month
Supervisor's salary	6,000 per quarter
Insurance premium for the machine	600 per annum
Estimated repairs for the machine	1,000 per annum
Estimated consumable stores	800 per annum
Power consumption 2 units per hour @ Rs. 50 per 100 units.	

The estimated life of the machine is 10 years and the estimated scrap value is Rs. 20,000. Th machine is expected to run 20,000 hours in its life time. The machine occupies 25% of the total area. The supervisor devotes ⅓th of his time for the machine. You are required to work out a machine hour rate.

46. From the following information compute a comprehensive machine hour rate :

Original Cost of the machine—Rs. 1,25,000 ;

Customs duty, insurance and freight paid—Rs. 15,000 ;

Installation expenses—Rs. 16,500 ;

Estimated Scrap Value after 12 years—10% of the original cost.

The machine is expected to operate 8 hours per day of 280 working days in the year out of which 160 hours are required for normal setting and another 80 hours for routine maintenance.

	Rs.
Rent and rates of the shop p.a.	4,800
General lighting of the shop p.m.	200
Insurance premium for the machine per quarter	300
Estimated cost of repairs and maintenance for the entire life of the machine	6,600
Shop supervisors' salary p.m.	1,000
Wages, workmen's Compensation insurance etc. of each of two operators (each operator is in charge of 2 machines) p.a.	9,600
Power Consumption of the machine per hour—10 units Rate of power per 100 units	75
Consumable Stores for the shop p.a.	1,250

Additional information : (*i*) There are four identical machines in the shop. (*ii*) The supervisor is expected to devote his time equally to the machines. (*C. U., B. Com. Hons. '89*)

47. Prepare a machine hour rate computation for the month of December, 1985, to cover the overhead expenses indicated below, relating to a particular machine :

	Per annum Rs.
Rent of department (space occupied by machine ⅛th of the department)	780
Lighting of department	240
Insurance etc. for the machine	36
Cotton Waste, Oil etc. for the machine	60
Salary of Foreman (⅛th of Foreman's time is occupied by this machine and the remainder equally upon two other machines)	6,000

The cost of the machine is Rs. 9,200 and it has an estimated scrap value of Rs. 200.

It is assumed from past experience :

(*a*) that the machine will work for 1,800 hours per annum ;

(*b*) that it will incur an expenditure of Rs. 1,000 for repairs and maintenance during the life time ,

(*c*) that it consumes 5 units of power per hour at a cost of 10 paise per unit : and

(*d*) that the working life of the machine will be 10 years

48. Work out, in the appropriate form, the machine hour rate of a Saw Mill with reference to the following items of information extracted from the account books of a wood working shop :

	Rs.
(i) Purchase price of the Saw Mill	90,000
(ii) Railway freight, other Incidental charges and installation charges	10,000
(iii) Life of the Saw Mill is 10 years @ 2,000 working hours per year.	
(iv) Repair charges—50 per cent of depreciation,	
(v) Consumption of electric power—10 units per hour @ 7 paise per unit.	
(vi) Lubricating oil @ Rs. 2 per day of 8 hours.	
(vii) Consumable store @ Rs. 10 per day of 8 hours.	
(viii) Wages of machine operator @ Rs. 5 per day of 8 hours.	

49. Calculate the machine hour rate from the following data. There are 4 identical machines :

(a) For each machine—

The cost of purchase is Rs. 60,000 ;

Estimated working life is 10 years ;

Residual or scrap value is Rs. 6,000 ;

Running time is 2,000 hours per annum.

(b) Wages, workmen's compensation insurance etc. of each of the two operators (each operator is in-charge of two machines) p.a. are Rs. 8,000 ;

(c) 30 units of electrical energy are consumed per hour per machine, cost of electrical energy being 6 paise per unit :

(d) Cost of repairs and maintenance per machine per annum is Rs. 4,000 ;

(e) Other factory overhead attributable to all the four machines together is Rs. 24,000 p.a.

50. A machine purchased for Rs. 50,000 was installed in a shop over one-fifth of its floor area at an additional cost of Rs. 10,000. The working life of the machine as also the scrap value, were estimated at 10 years and Rs. 5,000 respectively. From the following details compute the hourly rate of the machine :

	Rs.
Rent and Rates of the shop per year	2,500
General lighting of the shop per month	250
Repairs and Maintenance for the machine per year	1,500
Insurance Premium for the machine per quarter	300
Supervisor's Salary per month	500

It is estimated that the supervisor devotes one-fourth of his time for the machine.

The cost of power is Rs. 10 per 100 units and the machine consumes power at the rate of 10 units per hour.

Normal working hours of the machine is estimated at 1,200, but during the year it actually worked for 1,000 hours.   (*C. U., B. Com. Hons.*)

51. From the particulars furnished below compute the machine-hour rate :

	Rs.
Cost of machine	90,000
Cost of Installation	10,000
Scrap value at the end of 10 years	5,000
Indirect wages and materials for the machine	500 per year
Supervision cost for four similar machines	16,000 per year
Insurance premium for the machine	200 per quarter
Rent of the machine shop	400 per month
Electricity cost for the machine shop	100 per month

Power consumption of the machine is 20 units per actual working hour.

Power cost is 50 paise per unit.

The total area of the machine shop is 600 sq. metres of which this machine occupies only 150 sq. metres. There are 200 light points in the machine shop of equal wattage of which this machine utilises only 40 points.

It is estimated that the machine will normally work for 2,700 hours in a year, but it is apprehended that the machine will remain idle for 200 hours. (*C. U., B. Com. Hons. '85*)

52. Calculate Machine Hour Rate for recovery of overheads for a group of 4 machines from the following data .

> Original cost of the 4 machines Rs. 76,800.
> Depreciation at 10% per annum on straight line method.
> Maintenance cost average Rs. 8 per day of 8 hours for the group of machines.
> Power cost : 25 paise per running hour per machine.
> Supervision for the machine group Rs. 640 per month.
> Allocation of building depreciation for the four machines on a floor area basis. Rs. 80 per month.
> Share of manufacturing overheads, Rs. 240 per month for the group.
> Normal working days in the year, 300.
> Normal idle time 20%.
> Normal running, 1 shift of 8 hours per day.

53. A machine is purchased for cash at Rs. 9,200. Its working life is estimated to be 18,000 hours after which its scrap value is estimated at Rs. 200. It is assumed from past experience that .

> (i) the machine will work for 1,800 hours annually :
> (ii) the repair charges will be Rs. 1,080 during the whole period of life of the machine ;
> (iii) the power consumption will be 5 units per hour at 6 p. per unit.

Other annual standing charges are estimated to be :

> (*a*) Rent of department (machine occupies 1/5th area) Rs. 780
> (*b*) Light (12 points in the department—2 points engaged in the machine)   Rs. 288
> (*c*) Foreman's salary (1/4th of his time is occupied in the machine)   Rs. 6,000
> (*d*) Insurance premium (fire) for the machine   Rs. 36
> (*e*) Cotton wastes for the machine   Rs. 60

Find out the Machine Hour Rate on the basis of the above data for allocation of the works expenses to all jobs for which the machine is used.

54. Calculate the Machine Hour Rate from the following details :

Cost of machine No. 30 is Rs. 1,00,000. Estimated scrap value at the end of useful life of 10 years is Rs. 10,000. It is a 20 H. P. machine. It works 200 hours per month. ⅛th of the gross time is average idle time for setting of tools. Wages of two operators of this machine are Rs. 400 per month in total. However, bonus equal to 2 months' wages is payable to them per annum as per agreement.

Total value of the machines in the Machine Shop is Rs. 10 lakh including Rs. 1 lakh for machine No. 30 as above. Total H. P. of the machine shop is 1,200. There are 24 operators in the machine shop.

Annual insurance premium for the machine shop is Rs. 2,000. Other overheads for the shop amount to Rs. 12,000 per annum on an average. Cost of power for the shop amounts to Rs. 1,000 per month.

Other overheads should be distributed on the basis of the number of operators.

55. A factory operates for 50 weeks a year. For the other two weeks all the employees are given holiday at full pay and the employees also receive a bonus equal to a week's pay. The working hours per week are 44. From the following information you are required to compute the machine hour rate for Machine No. 12 (assume no breakdowns) in the machine shop of the factory :

(a) The machine is operated by two workmen, who are paid Rs. 70 and Rs. 40 per week respectively.

(b) Two foremen are employed in the machine shop and each is paid Rs. 154 per week.

(c) The horse-power of machine No. 12 is 5 and that of all the machines in the shop is 120.

(d) The power consumption of the machine shop is Rs. 264 per week.

(e) The purchase cost of the machine was Rs. 20,000 and its estimated scrap value is Rs. 1,025 after an estimated working life of 34,500 hours.

(f) The other overheads of the machine shop amount to Rs. 7,700 per year and are apportioned on the basis of the number of workmen.

(g) There are 28 workmen employed in the machine shop and those in the entire factory are 210.

(h) Administrative overheads of the entire factory are Rs. 57,750 for the whole year which are apportioned on the basis of the number of workmen.

56. A factory department—B.4—comprises 5 machines, each of the same type, size and capacity.

Two operators (a mechanic and his assistant) are employed on each of the machines.

A 40-hour week is worked, which includes 3 hours per week for adjustment and set-up time. This work is done jointly by the two machine operators. Their basic wages are : mechanic Rs. 4 per hour ; assistant Rs. 2 per hour. The average bonus rate on basic wage is 12½%. The company's year is divided into four 13-week periods.

It is desired to recover both the direct labour cost and the factory overhead by the application of a single machine rate.

Factory Overhead

1. Machine set-up time as above.
2. Depreciation at $12\frac{1}{2}\%$ on machine cost (Rs. 16,000 per machine).
3. Maintenance and repairs Rs. 25 per week per machine.
4. Consumable stores Rs. 14·50 per week per machine.
5. Electric current : 4 units (at $12\frac{1}{2}$ paise per unit) per hour per machine.
6. Allocations to department *B*.4.

Rent and rates :	Rs. 3,200 per annum
Heat, light etc. :	Rs. 4,000 per annum
Foreman's salary :	Rs. 14,400 per annum.

(a) Prepare a summary of the cost of operating one machine for a 13-week period ; and

(b) Compute the hourly rate for operating one machine.

57. A company hires out special equipment on an hourly charge. From the following information relating to two machines, you are required to prepare a statement showing the cost per hour which should be charged out for them in order to give a profit of 25 per cent on cost, and the total profit which each machine will earn in a year.

	Machines	
	Type A	*Type B*
Normal wage in hours	1,600	1,600
	Rs.	Rs.
Fuel and Lubricant cost per 50 hour	250	300
Annual Licence fee	200	250
Tyre costs per annum	600	800
Wage of driver per annum	6,000	7,200
Wages of driver's assistants per annum	3,600	4,800
Depreciation per annum	1,800	2,400

In addition to the above, each machine is allocated the following charges per annum :

Maintenance Rs. 6,400 ; Insurance Rs. 1,000 ; Management and Administration Rs. 3,000 ; Rates, Heating and Lighting Rs. 400 ; Selling Expenses Rs. 300.

The cost of tyres and depreciation may be assumed to bear a direct relationship to the number of hours for which the machines are in use.

58. For a department the standard overhead rate is Rs. 2·50 per hour and the overhead allowances are as follows :

Activity level (hours)	Budgeted overhead allowance Rs.
3,000	10,000
7,000	18,000
11,000	26,000

Calculate :

(a) the fixed cost :

(b) the standard activity level on the basis of which the standard overhead rate has been worked out.

59. An industrial concern manufactures three products known as *X, Y* and *Z*. Each product is started in the Machining area and completed in the Finishing Shop. The direct costs associated with each product forecast for the next trading period are :

	X	*Y*	*Z*
	Rs.	Rs.	Rs.
Materials	18·50	15·00	22·50
Wages :			
Machining area at Rs. 5 per hour	10·00	5·00	10·00
Finishing Shop at Rs. 4 per hour	6·00	4·00	8·00
	34·50	24·00	40·50

There are machines in both departments and machine hours required to complete one of each product are :

Machine area	4	1½	3
Finishing Shop	1/2	1/2	1
Budget output in units	6,000	8,000	2,000

Fixed overheads are :

Machining area	Rs. 1,00,800
Finishing Shop	Rs.　94,500

Required :

(a) an overhead absorption rate for fixed overheads using :

　(i) a Labour Hour rate for each department

　(ii) a Machine Hour rate for each department

(b) the total cost of each product using :

　(i) the Labour Hour rate

　(ii) the Machine Hour rate, as calculated in (a) above ,

(c) your comments to the Factory Manager who has suggested that one overhead rate for both departments would simplify matters.

(d) the fixed cost and the variable rate of overhead cost for the machining area. This has been constant over the previous five periods, and extracted from the following :

Period	Total overhead	Labour hours
	Rs.	
1	92,600	21,300
2	86,200	18,100
3	95,250	22,625
4	1,05,500	27,750
5	93,200	21,600

60. Cannon Ltd. has three production departments Forming, Assembling and Finishing. Three products, *A*, *B* and *C* are produced in these

departments. Fixed overhead costs have been identified as shown below with the budget for the coming year :

	Rs.
Rent and rates	11,700
Light and heat	5,400
Insurance and maintenance of building	8,100
Depreciation of building	18,000
Plant repairs and maintenance	11,200
Plant depreciation	49,000
Supervisory staff	30,000
Personnel department expenses	11,400
Canteen expenses	17,100
Warehouse expenses	13,200
Account, sales and other administration departmental costs	1,04,500
	2,79,600

The following information may be of relevance :

(*a*) Forming, Assembling and Finishing departments occupy 2,000, 1,500 and 1,000 square metres ; employ 20, 40 and 30 men of whom each should work 1,680 hours in the coming year and contain plant with current net book values of Rs. 2,80,000, Rs. 1,40,000 and Rs. 70,000 respectively.

(*b*) There are five supervisory staff each earning Rs. 6,000 p.a. in addition to the 90 strong workforce. the Forming department employs two, the Assembling department two, and the Finishing department one.

(*c*) Materials consumed by the three departments are expected to amount to Rs. 3,50,000, Rs. 1,50,000 and Rs. 50,000 respectively in the coming year.

(*d*) It is felt that 20% of the accounts, sales and other administration department costs should be apportioned according to number of staff in each department, 20% according to materials consumed, 30% split evenly across the departments and 30% allotted to the Finishing department.

(*e*) The time spent in each department on each product is shown below :

	Forming (hours)	Assembling (hours)	Finishing (hours)
A	0·4	2·0	1·0
B	0·4	1·0	1·0
C	1·0	0·5	0·5

Calculate fixed overhead cost per unit for each of the three products.

61. As cost accountant of Sisma Ltd. you have produced budgets for sales quantity, production, materials and labour utilisation and a variable overhead budget for the year ended 31st December, 1987. Information from the labour utilisation budget is shown below :

Department	Workforce	Labour hours	Hourly rate
A	20	35,000	Rs. 2·80
B	25	45,000	Rs. 2·60
C	30	55,000	Rs. 2·50

You have produced various estimates for the year's fixed costs, some of which can be easily allocated direct to the three departments and some of which are required to be apportioned between the three departments. The work so far is shown below :

Fixed cost	Rs.	*Allocation or proposed basis of apportionment*		
		A	*B*	*C*
Factory rent, rates and insurance	70,000		Floor area	
Plant depreciation	40,000	20,000	15,000	5,000
Repairs and maintenance	20,000	Net book value of assets weighted according to average age		
Works canteen	22,500		Number of employees	
Departmental office staff	59,000	15,000	18,000	26,000
Light and heat	10,500		Floor area	
Warehousing costs	21,000		Materials consumed	
Selling and administration	1,45,000	50,000	40,000	55,000
	3,88,000			

Your apportionment of fixed cost will be based on the following information :

	A	*B*	*C*
Floor area (sq. metres)	1,200	1,000	600
Net book value of assets (Rs.)	1,00,000	50,000	20,000
Average age of assets (years)	3	2	5
Materials consumed (Rs.)	2,60,000	1,20,000	40,000

(a) Produce a schedule showing the allocation or apportionment of the Rs. 3,88,000 of fixed costs to the three production departments.

(b) Calculate hourly fixed overhead absorption rates for the three departments.

(c) Produce a standard cost card showing how the selling price of a product P_s is arrived at, if the following variable costs are incurred :

Materials	Rs. 28·50
Labour : Department A	2 hours
B	4 hours
C	3 hours
Variable overheads	Rs. 19·85

Sisma Ltd. aims at a profit of 35% on sales.

Job, Contract and Batch Costing

JOB COSTING

There are certain manufacturing and non-manufacturing industries which produce goods or services against customers' orders and on the specifications given by them. These industries are known as *jobbing type industries.* Examples of *manufacturing jobbing type industries* are—Printing presses, Ship-builders, Shoe makers, Furniture makers, Construction Engineers, Machine Tool manufacturers, Garment makers, Foundries etc. ; and those of *non-manufacturing jobbing type industries* are—Automobile repairing shops, Consultant Engineers, Audit firms, Contract carriage suppliers etc.

The work of these undertakings can be identified by clearly distinguishable jobs, batches or contracts. Each job, batch or contract receives a particular degree of attention and skill depending upon the customer's specification.

The method of costing applied in these jobbing type industries is called JOB COSTING.

ICMA, London defines Job Costing as *"that category of basic costing methods which is applicable where the work consists of separate contract, jobs or batches each of which is authorised by specific order or contract."*

Under this method of costing, each job, batch or contract is treated as a cost unit and costs are collected and built up accordingly.

Salient features of job costing

The salient features of job costing can be mentioned as below :

(a) Work is carried out against customers' orders and not for maintaining stock for sale.

(b) Work has to be carried out according to the specification of the customers.

(c) Each job can be clearly identified from the other, or at least physical identification is presupposed.

(d) Each job requires particular attention and skill depending upon the specification.

(e) Every job does not pass through all the departments. Nature of the job decides through which departments it will pass.

(f) There is no standardisation of jobs. Each job is a separate non-standard work.

(g) Each job is to be charged with its own costs.

(h) Work-in-progress at any time depends upon the number of jobs in hand at that time. A separate work-in-progress record is maintained for each job.

Sub-division of job costing

Job costing may be sub-divided into (1) *factory job costing* and (2) *contract costing*. There is no difference in principles involved in both. Only in size they may differ.

Job costing method is also employed where production of the same commodity and style is carried out in batches of a particular number of units considered economic. For example, *North Star* Shoes of No. 7 size may be manufactured in batches of one hundred pairs. So the batch of 100 pairs is taken as the cost unit. In this case the method of costing is referred to as *batch costing*.

Advantages of job costing

The following advantages are claimed of job costing :

(*a*) Profitability of each job can be known separately.

(*b*) Management, on the basis of past job cost records, can make dependable estimates for similar future jobs.

(*c*) Job costing shows the material cost, labour cost, factory overheads, administration overheads, selling and distribution overheads for each job in detail and hence it facilitates the control of the costs of similar future jobs.

(*d*) On the basis of budgets, the overhead recovery rates may be pre-determined. This makes working out of the incidence of overheads for each job easy, but budgetary control becomes necessary so as to see that there is no gross over- or under-recovery of overheads.

(*e*) Under job costing, since each job is clearly distinguished from the other, the spoilage and defectives from each job can be separately known and hence they can be controlled.

(*f*) Job costing facilitates pricing of each job. Rates of profits, according to different types of jobs, are mentioned in the management policy. The applicable rate is applied on the estimated cost, to ascertain the price.

(*g*) In case of Govt. contracts of new nature, often the contract price is agreed at certain per cent added to cost (i.e., cost plus contracts). Job costing gives much advantage in this case.

(*h*) Detailed job cost records of the past periods can be preserved and studied to understand the trends of costs of different elements.

Disadvantages of job costing

The following are the principal disadvantages of job costing :

(*a*) The method is costly and laborious owing to much clerical work required to maintain detailed information.

(*b*) Cost records are made after the costs are incurred. So, control becomes impossible unless proper estimates or standards are set and control is exercised on the actual expenditure with reference to corresponding estimate or standard.

(*c*) Previous job cost records may fail to guide the future cost, if there is fundamental change in the market conditions.

(*d*) Errors in estimation or in cost records may bring about sad results.

FACTORY JOB COSTING

Factory job costing is that form of costing which applies in case of work undertaken to meet customers' special requirements. The work performed

against every job or product manufactured against every order is taken as a *unit of cost*. The repair of a particular motor car or printing of a particular matter of a definite number is regarded as a unit of cost i.e., job.

Duration of work of a job is shorter than the duration of work of a contract, although principles of costing involved in both are the same. Jobs are normally carried out in workshops, while contracts are mostly executed outside. Jobs are carried out in different departments, but each job runs through the departments as a distinguished work.

Procedure involved

The procedure of job costing may be discussed from different angles namely, *estimating, planning, production order, accounting* and *completion*.

Before securing a job from a customer, the price quotation has to be submitted. Price to be quoted depends upon *estimation* which is done carefully for each job on the basis of past experience and the trends of the prices of various elements in the market. In case of fluctuating market conditions, *escalation* clause is appended in the agreement.

On the quotation being accepted, the customer places the formal order. The planning department is to prepare the *production plan* for each job with details of execution in order to minimise wastage, defectives etc. Planning is, therefore, an important part in jobbing type of industries.

The planning department issues instructions to the production department to proceed with the work according to the production plan. This instruction authorises the production department to begin the work and is known as *production order, job order, factory order, work order* etc. Each order gets a separate *number* (called Production Order No., Job Order No., Work Order No. etc.) and contains all information relevant to the order. The production planning department usually prepares each production order in quadruplicate, one copy for production department, one copy for store-keeper, one copy for costing department and one copy to be retained as office copy of the production planning department itself. The following is a specimen form of a Production Order.

Production Order

Production Order No... ....   Quantity ordered...... ....
Customer's Order No..............Date..........   Date of Commencement......
Bill of Materials No..............   Date of Completion.......... .
Machines (required) Nos........   Special Instructions.... ....
Tools required......................

| Clock time | Operation No. | Deptt. No. | Operation | | Quantity | | Remarks |
			No.	Details	Produced	Rejected	

Signature

Accounting for job cost includes the following steps :

(i) Each job is charged for its own direct costs.

(ii) Each job is charged with its share of overheads of each cost centre through which it passes, according to any suitable method of overhead absorption.

(iii) Each job is charged with its share of administration overhead on any suitable method of absorption.

(iv) Each job is charged with its share of selling overhead when the job is treated as sold.

(v) Each job is charged with its share of distribution overhead when the job is delivered.

Let us discuss how the above steps are taken :

On the basis of production order the costing department prepares *a cost sheet* or *job account* for each job. This facilitates accumulation of job costs, elementwise, viz., direct material, direct labour, chargeable expenses and overhead charges. Materials are requisitioned and labour is booked for each job separately. In this case, Job No. is mentioned on the stores requisitions and labour Time Cards. When a job passes through various departments, departmentwise records for each job may be maintained.

The specimen of a *Job Cost Sheet* is given below .

JOB COST SHEET

Production Order No............   Date of Commencement............
Particulars of Job.................   Date of Completion............ ......
Customer No.....................Name.........   Date of Delivery....................
Quantity.......................

Elements	Date	Depart-ment	M/R No./ Ticket No./ Rate	Amount Rs.	Estimate Rs.	Difference (+)(−) Rs.
Direct Materials						
Direct Wages						
Direct Expenses						
Prime Cost Factory Overhead				....		
Works Cost Administration Overhead				....		
Cost of Production Selling & Distribution Overhead				....		
Cost of Sales				....		

[*Note* : M/R No. is mentioned for materials requisitioned for the Job, Ticket No. is mentioned for labour booked for the job and Rate for each type of overhead is mentioned.]

Sometimes the Job Cost Sheet is prepared in a simple form and a detailed sheet is prepared to show the various costs incurred in each department for the job. These are given below.

JOB COST SHEET

Production Order No. ....   Date of Commencement..........
Particulars of Job..................   Date of Completion...............
Customer No.........Name. ....   Date of Delivery....... ....
Quantity..............

Date	Reference	Elements of Cost	Cost	
			Total Rs	Per unit Rs.
		Direct Materials	....	....
		Direct Labour	....	....
		Chargeable expenses	....	....
		Prime Cost	....	....
		Factory Overhead	....	....
		Works Cost	....	....
		Administration Overhead	....	... .
		Cost of Production	....	.. ..
		Selling & Distribution Overhead	....	....
		Cost of Sales	....	.. ..

DETAILS

DIRECT MATERIALS				DIRECT LABOUR				CHARGEABLE EXP.			PRODUCTION OVERHEAD				Remarks
Date	Deptt.	M/R No.	Rs.	Date	Deptt.	Ticket No.	Rs.	Date	Deptt.	Rs.	Date	Deptt.	Rate	Rs.	

Collection of Costs of each job is done on the following bases :

(i) Materials as per *Stores Requisition* or *Material Analysis*

(ii) Wages as per *Time Tickets* or *Wages Analysis*

(iii) Direct Expenses as per *Direct Expense Voucher*

(iv) Overhead as per *Standing Order Numbers*

When the Job No. is noted on the Stores Requisitions and Time Tickets, collection of material cost and wages for each individual job is done on that basis. The amount of materials consumed and wages incurred may also be collected from bill of material, material analysis, wages analysis etc. The direct expenses are collected as per voucher prepared for that purpose for each job.

On completion of the job, overheads are charged on some suitable basis. Usually overheads are charged *as a percentage of direct wages, on the basis of predetermined rate per unit or per hour etc.*

Overtime is often worked in jobs at the request of the customers. So, the additional wage, i.e., overtime premium is treated as direct wage for the job. If overtime is of general nature and not at the instance of the customers. overtime premium is treated as factory overhead.

Accounting Procedure

A consolidated completed job account may be prepared for jobs completed during the accounting period and a consolidated work-in-progress account may be prepared for jobs in progress as on the closing date. Relevant amounts of materials, wages and overhead charges are debited to these accounts. In case of completed jobs, the customers' account is debited and consolidated completed job account is credited with the sale value of the jobs completed. Thus. the balance of the account shall show the profit or loss on jobs completed. In case of jobs in progress, the balance of the consolidated work-in-progress account is carried forward to the next period. In the next period if any of such jobs is completed, the relevant cost has to be transferred from the consolidated work-in-progress account to consolidated completed job account.

Where *control accounts* are maintained, the procedure is as below .

In case of job costing, a subsidiary ledger called Job Cost Ledger is maintained to record details in respect of each job. The Work-in-progress Control Account gives the total of the elements of cost incurred in respect of all the jobs executed in the factory. Whenever the jobs are completed. the cost of Sales Account is debited and the Work-in-progress Ledger Control Account is credited with the total cost of all jobs completed. The balance of the Work-in-progress Ledger Control Account shall, therefore, represent the cost of the jobs in progress. The following are the accounting entries :

Entries in Control Accounts :

(a) For purchase of materials—
     Stores Ledger Control A/c Dr.
          To Cost Ledger Control A/c

(b) For the value of direct materials issued to jobs—
     Work-in-progress Control A/c Dr.
          To Stores Ledger Control A/c

(c) For return of direct materials from jobs—
     Stores Ledger Control A/c Dr.
          To Work-in-progress Control A/c

Note : For return of materials to suppliers Cost Ledger Control A/c Dr. and Stores Ledger Control A/c Cr.

(d) For indirect materials—
     Factory Overhead Control A/c Dr.
          To Stores Ledger Control A/c

(e) For wages paid—
     Wages Control A/c Dr.
          To Cost Ledger Control A/c

(f) For direct wages incurred on jobs—
     Work-in-progress Control A/c Dr.
          To Wages Control A/c

(g) For indirect wages—
     Factory Overhead Control A/c Dr.
          To Wages Control A/c

(h) For any indirect expense paid—
     Factory Overhead Control A/c Dr.
          To Cost Ledger Control A/c

(i) For charging overhead to jobs—
     Work-in-progress Control A/c Dr.
          To Factory Overhead Control A/c

(j) For the total cost of jobs completed—
     Cost of Sales A/c Dr.
          To Work-in-progress Control A/c

(k) The balance of Cost of Sales A/c is transferred to Costing Profit
     & Loss A/c. For such transfer –
     Costing Profit & Loss A/c Dr.
          To Cost of Sales A/c

(l) For the Sales value of jobs completed—
     Cost Ledger Control A/c Dr.
          To Costing Profit & Loss A/c.

[*Notes* : 1. The balance of Costing Profit & Loss A/c shall now represent profit or loss. The balance of Cost Ledger Control A/c shall be carried forward. With the balance on all the accounts now prevailing, a Trial Balance can be drawn.

2. General Ledger Adjustment Account is the other name of Cost Ledger Control Account.]

Job Accounts in Subsidiary Books

For each job, a separate Job Account is prepared. To the Job Account all the elements of cost incurred are debited. *If a job is completed,* its balance represents *cost of sales* which is brought down to the next section of the Job Account. Now Sales A/c is debited and Job Account is credited with the sales value of the job. The balance in this section shows the profit or loss.

If a job is still in progress its balance is carried forward to the next period.

WORKED-OUT PROBLEMS

Problem 1.

According to the factory job cost ledger, Job No. B5436 has incurred the following prime cost :

Materials (Direct) : 36 kg. at Rs. 2·50 per kg.

Wages (Direct) : Department X 18 hours at Rs. 3·50 per hour
Department Y 32 hours at Rs. 3·00 per hour

Budgeted overhead for the year, based on normal capacity :
Variable overhead

Department X Rs. 6,000 for 9,000 direct labour hours

Department Y Rs. 8,000 for 10,000 direct labour hours

Fixed overhead

Total budgeted direct labour hours for the whole factory 22,000.

Total budgeted fixed expenditure Rs. 16,500.

You are required to—

(a) Calculate the cost of Job No. B5436

(b) Estimate the % of profit obtained, if the price quoted to the customer was Rs. 400.

Solution :

Job Cost Sheet (Job No. B5436)

		Rs.
Direct materials : 36 kg. @ Rs. 2·50	...	90·00
Direct wages : Department X 18 hours @ Rs. 3·50	...	63·00
Department Y 32 hours @ Rs. 3·00	...	96·00
Overheads : Variable—		
Department X 18 hours @ 66⅔ p. per hour	...	12·00
Department Y 32 hours @ 80 p. per hour	...	25·60
Fixed—50 hours @ 75 p. per hour	...	37·50
(a) Total Cost	...	324·10
(b) Profit (*balancing figure*) : 19% on sale (Approx.)	...	75·90
		400·00

Working Notes :

Overhead rates :

Variable : $x \dfrac{\text{Rs. } 6,000}{9,000} = 66\frac{2}{3}$ p. per direct labour hour

$y \dfrac{\text{Rs. } 8,000}{10,000} = 80$ p. per direct labour hour

Fixed : $\dfrac{\text{Rs. } 16,500}{22,000} = 75$ p. per direct labour hour ; working hrs. 18+32 or 50.

Problem 2.

A company in the electronics industry manufactured 60,000 calculators in the year ended December 31, 1986, and sold all of these at Rs. 180 each. They plan to increase production by 25 per cent and to reduce the selling price by Rs. 10 per calculator. The trading results for the year ended December 31, 1986 were as follows :

	Rs. (in lacs)	Rs. (in lacs)
Sales : 60,000 at Rs. 180 each		108·00
Less Costs :		
Materials	39·00	
Direct labour	18·00	
Indirect labour	6·75	
Other costs	19·00	82·75
Profit		25·25

The increase in production is expected to need changes in the operating activities and arrangements have been made to ensure that improved trading results are obtained :

(*a*) As an incentive to increase output, the employees on direct labour are to receive a special bonus of 3 per cent on their earnings, provided the target of 25 per cent is met.

(*b*) No increase is anticipated in the cost of indirect labour.

(*c*) Other costs include Rs. 2,50,000 which is fixed and the new arrangements will add a further Rs. 75,000 to this item.

(*d*) The entire output as planned is expected to be sold in the financial year and it is to be assumed that, there will be no stock or work-in-progress.

(*e*) Negotiations have been concluded with the suppliers of materials, and prices are to be reduced by 6 per cent in view of the increase in the quantities of materials.

Prepare an estimate in the form of a cost statement, setting out the results to be expected, if production can be increased as planned,

Solution :

Estimated Cost Statement
in respect of the production of 75,000 calculators

	Rs. (in lacs)	Rs. (in lacs)
Sales : 75,000 at Rs. 170		127·500
Less : Costs :		
Materials : 75,000 at Rs. 61·10	45·825	
Direct labour : 75,000 at Rs. 30·90	23·175	
Indirect labour	6·750	
Other cost : 75,000 at Rs. 27·50 + Rs. 3,25,000 (fixed)	23·875	99·625
Profit		27·875

Working Notes :

Materials : $\dfrac{\text{Rs. } 39,00,000}{60,000}$ = Rs. 65 each. After 6% reduction

= Rs. 65 × $\dfrac{94}{100}$ = Rs. 61·10 each

Direct labour : $\dfrac{\text{Rs. } 18,00,000}{60,000}$ = Rs. 30 each.

After 3% increase. Rs. 30 × $\dfrac{103}{100}$ = Rs. 30·90 each

Other costs : Variable $\dfrac{\text{Rs. } 19,00,000 - \text{Rs. } 2,50,000}{60,000}$ = Rs. 27·50

Fixed Rs. 2,50,000 + Rs. 75,000 = Rs. 3,25,000.

Problem 3.

Lindwal Ltd. uses Job Costing. The following are the cost figures relating to the calendar year, 1982 :

	Rs.
Direct materials	1,20,000
Direct wages	1,00,000
Factory overhead	60,000
Administration overhead	56,000
Selling and Distribution overhead	42,000

(i) Prepare a Job Cost Sheet for the year, showing therein the prime cost, works cost, cost of production, cost of sales and selling price, adding 20% to cost.

(ii) Work out the overhead recovery rates, assuming that the factory overhead is recovered as a percentage of direct wages and administration, selling and distribution overheads as a percentage of works cost.

(iii) Ascertain the selling price of a job to be executed in 1983 on the basis of the overhead recovery rates worked out as above and also the same percentage of profit on cost as in 1982. The job, it is estimated, shall consume materials worth Rs. 60,000 and wages Rs. 40,000.

Solution :

Job Cost Sheet

(i)   *for the year ended 31st December, 1982*

	Rs.
Direct Materials	1,20,000
Direct Wages	1,00,000
Prime Cost	2,20,000
Factory Overhead	60,000
Works Cost	2,80,000
Administration Overhead	56,000
Cost of Production	3,36,000
Selling & Distribution Overhead	42,000
Cost of Sales	3,78,000
Profit at 20% on cost	75,600
Selling Price	4,53,600

(ii) Overhead Recovery Rates :

$$\text{Factory Overhead :} \quad \frac{60,000}{1,00,000} \times 100 = 60\% \qquad (\% \text{ on wages})$$

$$\text{Administration Overhead} \quad \frac{56,000}{2,80,000} \times 100 = 20\% \ (\% \text{ on works cost})$$

$$\text{Selling \& Distribution Overhead :} \quad \frac{42,000}{2,80,000} \times 100 = 15\%$$

$$(\% \text{ on works cost})$$

(iii) Estimates for Job No.........to be executed in 1983

		Rs.
Direct Materials	...	60,000
Direct Wages	...	40,000
Prime Cost	...	1,00,000
Factory Overhead @ 60% of Direct Wages	...	24,000
Works Cost	...	1,24,000
Administration Overhead @ 20% of Works Cost	...	24,800
Cost of Production	...	1,48,800
Selling & Distribution Overhead @ 15% of Works Cost	...	18,600
Cost of Sales	...	1,67,400
Profit @ 20% on cost	...	33,480
Selling Price	...	2,00,880

Problem 4.

The budgeted costs of a manufacturing business for a normal year are as follows :

	Rs.	Rs.
Direct materials		68,273
Direct wages :		
Machine shop (10,000 hours)	27,382	
Assembly (8,000 hours)	22,780	50,162

	Rs.	Rs.
Works overheads :		
Machine shop	33,490	
Assembly	16,237	49,727
Administration overheads		12,268
Selling expenses		15,481
Distribution expenses		13,290

The absorption method of costing is in operation.

Prepare a schedule of overhead rates suitable for practical use in the business.

Complete the cost estimate for a job, the technical data for which are as follows :

Material : 20 kg. of *A* at Rs. 10 per kg.
15 kg. of *B* at Rs. 4 per kg.

Direct labour : Machine shop : 15 hours at Rs. 3 per hour
Assembly : 25 hours at Rs. 3·50 per hour

Solution :

Schedule of Predetermined Overhead Rates for the year—

1. Works Overhead :

Machine shop : $\dfrac{\text{Budgeted Overhead}}{\text{Budgeted Machine Hours}}$

i.e., $\dfrac{\text{Rs. } 33,490}{10,000} =$ Rs. 3·35 (approx.) per machine hour

Assembly shop : $\dfrac{\text{Budgeted Overhead}}{\text{Budgeted Assembly Hours}}$

i.e., $\dfrac{\text{Rs. } 16,237}{8,000} =$ Rs. 2·03 (approx.) per assembly hour.

2. *Administration Overhead :* $\dfrac{\text{Budgeted Overhead}}{\text{Budgeted Works Cost}} \times 100$

i.e., $\dfrac{12,268}{1,68,162^1} \times 100 = 7·3\%$ of works cost.

3. *Selling Overhead :* $\dfrac{\text{Budgeted Overhead}}{\text{Budgeted Cost of Production}} \times 100$

i.e., $\dfrac{15,481}{1,80,430^2} \times 100 = 8·6\%$ of cost of production.

4. Distribution Overhead : $\dfrac{\text{Budgeted Overhead}}{\text{Budgeted Cost of Production}} \times 100$

i.e., $\dfrac{13,290}{1,80,430^2} \times 100 = 7·3\%$ of cost of production.

Cost Estimated for Job No.........

		Rs.
Direct materials : 20 kg. of *A* @ Rs. 10	...	200·00
15 kg. of *B* @ Rs. 4	...	60·00
Direct wages : Machine shop 15 hours @ Rs. 3	...	45·00
Assembly shop 25 hours @ Rs. 3·50	...	87·50
Prime Cost	...	392·50
Works Overhead : Machine shop 15 hours @ Rs. 3·35	...	50·25
Assembly shop 25 hours @ Rs. 2·03	...	50·75
Works Cost	...	493·50
Administration Overhead : 7·3% of 493·50	...	36·03
Cost of Production	...	529·53
Selling Overhead : 8·6% of Rs. 529·53	...	45·54
Distribution Overhead : 7·3% of Rs. 529·53	...	38·66
Total Cost	...	613·73

Working Notes :

[1]Budgeted Works Cost : Rs. (68,273 + 50,162 + 49,727) = Rs. 1,68,162

[2]Budgeted Cost of Production : Rs. (1,68,162 + 12,268) = Rs. 1,80,430.

Problem 5.

Job number 505 was completed in three departments of a factory. Cost details for this job were :

Department	Direct Materials	Direct Wages	Direct Labour Hours
	Rs.	Rs.	
X	650	800	1,000
Y	940	300	400
Z	230	665	700

Works overhead is recovered on the basis of direct labour hours and administration overhead as a percentage of works cost.

The figures for the last cost period for the three departments on which the current overhead recovery rates are based, were :

Departments	X	Y	Z
Direct material	Rs. 6,125	Rs. 11,360	Rs. 25,780
Direct wages	Rs. 9,375	Rs. 23,400	Rs. 54,400
Direct Labour Hours (Nos.)	12,500	36,000	64,000
Works overhead	Rs. 5,000	Rs. 7,200	Rs. 9,600
Administration overhead	Rs. 2,870	Rs. 14,686	Rs. 8,978

You are required to draw up a cost ledger sheet showing the cost of Job No. 505, and to show the price charged, assuming a profit margin of 20% on total cost.

Solution :

Calculation of works overhead recovery

	X	Y	Z
Works overhead	Rs. 5,000	Rs. 7,200	Rs. 9,600
Direct labour hours	12,500	36,000	64,000
Recovery rate per hour	40p	20p	15p
Job 505—Hours	1,000	400	700
—Overhead recovery (Rs.)	Rs. 400	Rs. 80	Rs. 105

Calculation of administration overhead recovery

	X	Y	Z
	Rs.	Rs.	Rs.
Direct materials	6,125	11,360	25,780
Direct wages	9,375	23,400	54,400
Works overhead	5,000	7,200	9,600
Works cost	20,500	41,960	89,780
Admin. overhead	Rs. 2,870	Rs. 14,686	Rs. 8,978
as a percentage of works cost	14%	35%	10%
Job No. 505—Works cost	Rs. 1,850	Rs. 1,320	Rs. 1,000
—Overhead recovery	Rs. 259	Rs. 462	Rs. 100

Cost Sheet for Job 505

		X Rs.	Y Rs.	Z Rs.	Total Rs.
Direct Materials	...	650	940	230	1,820
Direct Labour	...	800	300	665	1,765
Prime Cost	...	1,450	1,240	895	3,585
Works Overhead	...	400	80	105	585
Works Cost	...	1,850	1,320	1,000	4,170
Administration Overhead	...	259	462	100	821
Total Cost	...	2,109	1,782	1,100	4,991
Profit margin @ 20% on cost	...				998
Price Charged	...				5,989

Problem 6.

A job passes through machine numbers I, IV, V and VII of which the machine hour rates are Rs. 1·50, Rs. 2·00, Rs. 2·25 and Rs. 2·50 respectively. The job has been charged for direct materials Rs. 15,000 and direct wages Rs. 10,000.

The job engages the machine as below :

Machine No.   I for 100 hours.

     ,,   ,, IV for 300 ,,

     ,,   ,, V for 500 ,,

     ,,   ,,VII for 200 ,,

Office overhead is 40% of works cost.

Surplus materials worth Rs. 2,000 have been returned to stores.

The outturn of the job has been 400 units ; but 10% of the production has been disapproved by the customer and hence sold in the market for Rs. 500 less than the cost.

Assuming that the company makes a profit of 20% on sales, prepare a job cost sheet showing the selling price per unit approved.

Solution :

Job Cost Sheet

			Rs.
Direct materials	15,000		
Less : Returned	2,000		
			13,000·00
Direct Wages		...	10,000·00
Prime Cost		...	23,000·00
Factory Overhead :			
Machine No. I 100×Rs. 1·50	150		
Machine No. IV 300×Rs. 2·00	600		
Machine No. V 500×Rs. 2·25	1,125		
Machine No. VII 200×Rs. 2·50	500		
			2,375·00
Works Cost		...	25,375·00
Office Overhead at 40% of Works Cost		...	10,150·00
			35,525·00
Less : Cost of goods disapproved (10% of 35,525·00)		...	3,552·50
			31,972·50
Add : Loss on sale of disapproved units charged to job (3,552·50−3,052·50)		...	500·00
Cost of Production (of 360 approved units)		...	32,472·50
Profit at 20% on Sales i.e., 25% on Cost		...	8,118·12
Selling Price		...	40,590·62
Selling Price per unit (Rs. 40,590·62 ÷ 360)		...	112·75 (Approx.)

Problem 7.

Your company manufactures two products *A* and *B*. During a month 300 units of product *A* and 400 units of product *B* have been manufactured. The total expenses incurred in the said month had been as follows :

	Rs.
Materials	2,97,000
Wages (Direct)	18,000
Stores Overhead	29,700
Machinery maintenance	8,700
Depreciation	4,350
Workmens' amenities	2,250
General works expenses (to be charged as a % of direct wages)	15,000
Administration and selling expenses (to be charged as a % of works costs)	18,750

Other data available are—

	A	B
Material cost ratio per unit	1	2
Direct labour ratio	2	3
Machine utilisation ratio	3	5

Calculate cost per unit of each product.

(C. U., B. Com. Pass '87)

Solution :

Statement of Cost

	Total Rs.	A (300 units) Rs.	B (400 units) Rs.
Materials (300×1 : 400×2 or 3 : 8) ...	2,97,000	81,000	2,16,000
Direct wages (300×2 : 400×3 or 6 : 12) ...	18,000	6,000	12,000
Stores overhead (based on materials i.e., 10%) ...	29,700	8,100	21,600
Machinery maintenance (based on machine utilisation i.e., 300×3 : 400×5 or 9 : 20) ...	8,700	2,700	6,000
Depreciation (based on machine utilisation i.e., 9 : 20) ...	4,350	1,350	3,000
Workmen amenities (based on direct wages i.e., 12·5%) ...	2,250	750	1,500
General works expenses (based on direct wages i.e., 83⅓%) ...	15,000	5,000	10,000
Total Works Cost ..	3,75,000	1,04,900	2,70,100
Administration and selling expenses (based on works cost i.e., 5%) ...	18,750	5,245	13,505
Total Cost ...	3,93,750	1,10,145	2,83,605
Cost per unit ...		367·15	709·01

Problem 8.

As a newly appointed cost accountant, you find that the selling price of Job No. 231 has been calculated on the following basis :

	Rs.
Materials	10·00
Direct wages—20 hours @ Re. 0·25 per hour	5·00
Deptt. *A*—10 hours	
Deptt. *B*—4 hours	
Deptt. *C*—6 hours	
Prime Cost	15·00
Add : 33⅛% on prime cost	5·00
Works Cost	20·00

Cost. (Part. I)—27

An analysis of the previous year's profit and loss account shows the following :

		Rs.		Rs.
Materials used		42.000	Sales	1,00,000
Direct Wages :				
Department *A*	5,000			
Department *B*	6,000			
Department *C*	4,000	15,000		
Factory Overhead :				
Department *A*	6,000			
Department *B*	9,000			
Department *C*	4,000	19,000		
Gross Profit c/d		24,000		
		1,00,000		1,00,000
Selling Overhead		19,000	Gross Profit b/d	24,000
Net profit		5,000		
		24,000		24,000

You are required to—

(*a*) draw up a job cost sheet ;

(*b*) calculate and enter the revised costs using the previous year's figure as a basis ;

(*c*) add to the total job cost 10% for profit and give the final selling price.

Solution :

Overhead rates on the basis of last year's figures
Factory Overhead

Department *A* :

Factory overhead = Rs. 6,000

Direct labour hours : $\dfrac{\text{Total wages}}{\text{Hourly rate}} = \dfrac{5,000}{0\cdot25} = 20,000$

Rate per hour = $\dfrac{\text{Rs. } 6,000}{20,000} = $ Re. 0·30

Department *B* :

Factory overhead = Rs. 9,000

Direct labour hours = $\dfrac{6,000}{0\cdot25} = 24,000$

Rate per hour = $\dfrac{\text{Rs. } 9,000}{24,000} = $ Re. 0·375

Department *C* :

Factory overhead = Rs. 4,000

Direct labour hours = $\dfrac{4,000}{0\cdot25} = 16,000$

Rate per hour = $\dfrac{\text{Rs. } 4,000}{16,000} = $ Re. 0·25

Selling Overhead

Works cost = Rs. (42,000 + 15,000 + 19,000) or Rs. 76,000

Selling overhead = Rs. 19,000

Selling overhead as percentage of works cost $= \dfrac{19,000}{76,000} \times 100 = 25\%$.

Job Cost Sheet

Job No. 231 *Period.*

		Rs.
Materials		10·00
Direct Wages :	Rs.	
Department *A*	2·50	
Department *B*	1·00	
Department *C*	1·50	5·00
Prime Cost		15·00
Factory Overhead :	Rs.	
Department *A* (10 hours @ Re. 0·30)	3·00	
Department *B* (4 hours @ Re. 0·375)	1·50	
Department *C* (6 hours @ Re. 0·25)	1·50	6·00
Works Cost	...	21·00
Selling Overhead (25% on Works Cost)	...	5·25
Cost of Sales	...	26·25
Profit (10% on cost)	...	2·63
Selling Price	...	28·88

Problem 9.

A company operates in an area where there is little prospect of increasing its labour force. It employs 20 direct operatives whose working week is 40 hours each and whose average rate of pay is Rs. 3 per hour. No overtime is worked.

On 1st October, 1983, the company had to choose any of the two contracts, with Alpha Ltd. and Beta Ltd. each of which would last until the end of December, 1983, and which cannot be undertaken at the same time.

Standard prime costs for each contract, and the best prices that can be obtained are :

	Alpha Ltd. *Contract*	*Beta Ltd.* *Contract*
	Rs.	Rs.
Direct Material Cost	90 per dozen	30 per dozen
Direct wages	30 ,, ,,	60 ,, ,,
Selling price	215	270 .. ..

The company's standard overhead per week is Rs. 6,000 of which Rs. 4,000 is variable and Rs. 2,000 fixed. Its overhead is absorbed by a standard rate per direct labour hour.

You are required :

(a) To calculate the total cost per dozen of product under each contract ;

(*b*) To calculate the percentage of profit on sales for each contract ;

(*c*) To state which contract you recommend the company should undertake. Give reasons with supporting figures for your decision.

Assume that there are no reasons of special policy which favour one contract or the othe .

Solution :

The time to be taken by both the jobs is the same, viz., 12 weeks (October to December).

There are 20 direct operatives, each working 40 hours a week. Hence total man-hours in a week $= 40 \times 20 = 800$.

For 800 man-hours, weekly variable overhead is Rs. 4,000. Hence for each man-hour, variable overhead is $\frac{\text{Rs. } 4,000}{800}$ or Rs. 5

Similarly, for 800 man-hours, weekly fixed overhead is Rs. 2,000. Hence for each man-hour, fixed overhead is $\frac{\text{Rs. } 2,000}{800}$ or Rs. 2·50

For one dozen units of Alpha job, wages are Rs. 30 @ Rs. 3 per hour. Hence it requires $\frac{30}{3}$ or 10 man-hours. Similarly, one dozen units of Beta job require $\frac{60}{3}$ or 20 man-hours.

<p align="center">Statement of cost per dozen of Alpha and Beta Jobs</p>

		Alpha		*Beta*
		Rs.		Rs.
Materials		90		30
Wages		30		60
Overheads :				
Variable	$10 \times$ Rs. 5	50	$20 \times$ Rs. 5	100
Fixed	$10 \times$ Rs. 2·50	25	$20 \times$ Rs. 2·50	50
Total cost		195		240
Selling Price		215		270
Profit		20		30
Percentage of Profit on Sales		$\frac{20}{215} \times 100$ $= 9 \cdot 3\%$		$\frac{30}{270} \times 100$ $= 11 \cdot 1\%$

Hence job Beta should be recommended.

Problem 10.

A small company carries out fabrication work in a department where certain employees set up the work before the main operation is completed by other employees. The cost of labour engaged on setting-up is charged to overhead expenses and during a particular period 1,250 hours were spent on this work at a cost of Rs. 3,750. During this period the following costs were incurred on three jobs (Job 1, Job 2, Job 3) :

	Rs
Direct materials	8,250
Direct labour	11,250
Overhead expenses	18,000
	37,500

Other information which applies to these jobs include :

	Job 1	Job 2	Job 3
Setting-up (hours)	375	250	625
Direct labour (hours), excluding setting-up time	2,400	300	1,800
Direct material costs	Rs. 4,540	Rs. 525	Rs. 3,185

Job costing is carried out by the use of hourly rates for direct labour and for overheads, but a new system is proposed whereby three hourly rates for direct labour, for setting labour and for overheads excluding the cost of setting-up time are worked out and applied.

(a) Calculate the hourly rates under the old and the new systems and prepare costs as complied under the existing costing system and also costs under the proposed system.

(b) Indicate which method of costing in your opinion provides the most accurate costs.

Solution :

(a) *Existing system*

Wages rate per direct labour hour : $\dfrac{\text{Direct labour cost}}{\text{Total direct labour hrs.}}$

$$= \frac{\text{Rs. } 11,250}{4,500} = \text{Rs. } 2\cdot50 \text{ per hour}$$

Overhead per direct labour hour : $\dfrac{\text{Overhead expenses}}{\text{Total direct labour hrs.}}$

$$= \frac{\text{Rs. } 18,000}{4,500} = \text{Rs. } 4 \text{ per hour}$$

Proposed system

Wages rate per direct labour hour :

Rs. 2·50 as under the existing system

Wages rate for setting-up : $\dfrac{\text{Wages cost}}{\text{Setting-up time}}$

$$= \frac{\text{Rs. } 3,750}{1,250} = \text{Rs. } 3\cdot00 \text{ per hour}$$

Overhead per direct labour hour :

$$\frac{\text{Overhead expenses } \textit{less} \text{ cost of setting-up}}{\text{Direct labour hours including setting-up time}}$$

$$= \frac{\text{Rs. } 14,250}{5,750} = \text{Rs. } 2\cdot48 \text{ per hour } (\textit{approx.})$$

Cost Statement

	Job 1 Hrs.	Job 1 Rate Rs.	Job 1 Rs.	Job 2 Hrs.	Job 2 Rate Rs.	Job 2 Rs.	Job 3 Hrs.	Job 3 Rate Rs.	Job 3 Rs.
Under Existing system									
Direct materials			4,540			525			3,185
Direct labour	2,400	2·50	6,000	300	2·50	750	1,800	2·50	4,500
			10,540			1,275			7,685
Overheads	,400	4·00	9,600	300	4·00	1,200	1,800	4·00	7,200
			20,140			2,475			14,885
Under Proposed system									
Direct materials			4,540			525			3,185
Direct labour	2,400	2·50	6,000	300	2·50	750	1,800	2·50	4,500
Direct labour (setting)	375	3·00	1,125	250	3·00	750	625	3·00	1,875
			11,665			2,025			9,560
Overheads	2,775	2·48	6,882	550	2·48	1,364	2,425	2·48	6,014
			18,547			3,389			15,574

(b) The proposed new system provides cost more accurately than what the existing system can do. There is no direct relationship between the setting-up time for the three jobs and the amount of direct labour hours involved in each case. Thus, job 2 has a small number of direct labour hours, but requires a large number of hours in setting-up the work. The wages for setting-up time are in fact direct labour, because the same can be easily identified with and allocated to the job concerned. Calculation of the prime cost and the charge for overhead expenses will be more accurate under the proposed system. Most of the overhead expenses are time based and thus, a more accurate cost is obtained by adjusting the direct labour hours on each job and the rate of overhead expenses.

Problem 11.

A specialist manufacturer of purpose-built plant is engaged in three separate jobs in May, 1987. The following costs were incurred :

	Job A	Job B	Job C
Direct materials purchased	Rs 524	Rs. 671	Rs. 382
Direct labour :			
skilled, hours	158	170	16
semi-skilled, hours	316	190	30
Site expenses	Rs. 118	Rs. 170	Rs. 25
Selling price of job	Rs. 3,318	Rs. 2,750	Rs. 1,950
Completed at 31st May, 1987	100%	80%	

The following information is available :

Direct materials for the completion of the jobs have been recorded.

Direct labour is paid—skilled @ Rs. 5. per hour

                         semi-skilled @ Rs. 4 per hour.

Site expenses tend to vary with output.

Administration expenses total Rs. 440 per month and are to be allocated to the jobs.

On completion of the work, the practice of the manufacturer is to divide the calculated profit on each job as—20% to site staff as a bonus, 80% to the company. Calculated losses are absorbed by the company in full.

You are required to :

  (a) Calculate the profit or loss by the company of job *A*.

  (b) Project the profit or loss by the company of jobs *B* and *C*.

  (c) Comment on any matters, you think relevant, to management, as a result of your calculations.

  (d) Advise management whether to accept job *D* which must be delivered by 30th June, 1987. Job *D* is identical to job *B*, but the customer has agreed to accept a 10% increase in the selling price. As jobs *B* and *C* must also be delivered by 30th June, management is concerned that there may be insufficient supply of labour, as this cannot be increased. No other orders are in prospect.

Solution :

(a)   **Job Cost Sheet**

	Job A	Job B	Job C
	Rs.	Rs.	Rs.
Direct materials	524	671	382
Direct Labour—skilled	790	850	80
—unskilled	1,264	760	120
Site expenses	118	170	25
Administration expenses (apportioned on the basis of labour hours) (474 : 360 : 46)	237	180	23
Up-to-date costs	2,933	2,631	630
Selling price	3,318		
Profit	385		
Bonus to staff (20%)	77		
Profit to Company	308		

(b)   **Projected Profit of Job B and C**

	Job B	Job C
	Rs.	Rs.
Up-to-date costs	2,631	630
Further costs to complete		
B—20% (excluding materials)	490	
C—75% (excluding materials)		744
Projected total cost	3,121	1,374
Selling Price	2,750	1,950
Profit (Loss)	(371)	576
Bonus to staff (20%)	—	115
Profit (Loss) to Company	(371)	461

(c) Job *B* will ultimately result in a loss. Hence steps should be taken to control costs. In fact, the material costs are relatively high ; the proportion of skilled labour to semi-skilled labour is also relatively high. Besides, attempts should be made to re-negotiate the selling price.

Cost analysis of Job D

Only the variable costs are included while estimating the cost of Job *D* on the assumption that the administration costs are fixed and are fully absorbed by Jobs *A*, *B* and *C*.

	Rs.
Cost of job *D* (on the basis of the projected cost of job *B*)	3,121
Less : Administration costs included $(180 \times \frac{100}{80})$[1]	225
Marginal cost	2,896
Proposed selling price (2,750+10%)	3,025
Contribution (Profit)	129

Acceptance of the job will result into an increase of Rs. 129 in contribution and hence in profit. It is, therefore, advisable to accept the job, provided the required labour is available as it cannot be increased. Calculation of availability of labour is shown below :

	Skilled	*Semi-skilled*
Total labour hours available	343	536
Labour hours required		
B	42·5	47·5
C	48	90
D	212·5	237·5
	303	375

The existing labour is sufficient to complete the job and thus, Job *D* can be accepted.

Note. 1. Adm. cost of Job *B* was Rs. 180 for 80% completion. Hence it would be Rs. 225 for full completion.

Problem 12.

The books and records of the factory of Lindwal Ltd. supply the following information relevant to the year ended 31st December, 1983 :

	Jobs Completed Rs.	*Jobs in Progress* Rs.
Materials issued from stores	1,25,000	68,000
Wages booked	1,80,000	84,000
Direct expenses incurred	15,000	8,500

Out of the materials issued to jobs completed, materials valued at Rs. 4,500 have been transferred to jobs in progress as on 31st Dec., 1983 and those valued at Rs. 1,500 have been returned to stores.

Factory overhead is recovered as a percentage of direct wages and office overhead is recovered as a percentage of works cost, the relevant percentages, for the year, being 15% and 20% respectively. The value of the jobs completed is Rs. 4,75,000.

You are asked to prepare (i) Consolidated Completed Jobs Account showing profit or loss thereon and (ii) Consolidated Work-in-Progress Account.

Solution :

Dr.   **Consolidated Completed Jobs Account**   Cr.

	Rs.		Rs.
To Materials Consumed :		By Contractee account (value	4,75,000
Materials issued 1,25,000		of jobs completed)	
Less : Transferred to			
Work-in-Progress 4,500			
1,20,500			
Less : Returned to			
Store 1,500			
	1,19,000		
,, Wages	1,80,000		
,, Direct Expenses	15,000		
Prime Cost	3,14,000		
,, Factory overhead (at 15%			
of Wages)	27,000		
Works Cost	3,41,000		
,, Office overhead (at 20% of			
Works Cost)	68,200		
Total Cost	4,09,200		
,, Costing Profit & Loss A/c			
(Net Profit transferred)	65,800		
	4,75,000		4,75,000

Dr.   **Consolidated Work-in-Progress Account**   Cr.

	Rs.		Rs.
To Materials Consumed :		By Balance Carried forward	2,13,120
Materials issued 68,000			
Add : Transferred from			
Completed jobs 4,500			
	72,500		
,, Wages	84,000		
,, Direct Expenses	8,500		
Prime Cost	1,65,000		
,, Factory overhead (at 15%			
of Wages)	12,600		
Works Cost	1,77,600		
,, Office overhead (at 20% of			
Works Cost)	35,520		
	2,13,120		2,13,120

Problem 13.

From the following information obtained from the books and records of Lindwal Works Ltd. prepare (1) the relevant Control Accounts and prove the arithmetical accuracy of recording by drawing a Trial Balance and (2) Job Accounts as they would appear in the subsidiary Job Cost Ledger.

(i)	*Balances on 1. 1. '84 :*		Rs.	Rs.

(i) *Balances on 1. 1. '84 :*　　　　　　　　Rs.　　　Rs.
　　　Debits—Stores Ledger Control Account　　8,700
　　　Work-in-progress Control Account :　Rs.
　　　Job No. 135　　　　　　　　　　6,150
　　　　,, ,, 141　　　　　　　　　　5,200
　　　　,, ,, 143　　　　　　　　　　8,750
　　　　., ,, 144　　　　　　　　　　2,200　　22,300

　　　Credits –Cost Ledger Control Account　　　　　31,000

(ii) *Transactions during January, 1984*
　　　　　　　Materials Purchased　　　　　　　12,200
　　　　　　　Factory indirect expenses　　　　　3,600
　　　　　　　Staff welfare expenses　　　　　　4,400
　　　　　　　Direct materials issued to jobs　　　14,400
　　　　　　　Indirect materials issued　　　　　2,000
　　　　　　　Direct Wages paid　　　　　　　　28,000
　　　　　　　Indirect Wages paid　　　　　　　7,000

(iii)　Materials returned from Job No. 144　　　　　300

(iv)　Nos. of new jobs started in the month –148, 149

(v)　Jobs completed in the month and their sales values—
　　　　　　　Job No. 135　　　Rs. 12,500
　　　　　　　Job No. 141　　　Rs. 18,850
　　　　　　　Job No. 143　　　Rs. 16,800

(vi)　Allocation of Direct Materials and Direct Wages as per analyses for the month :

Job Nos.	Direct Materials Rs.	Direct Wages Rs.
135	500	2,500
141	2,600	4,600
143	1,800	6,200
144	3,500	5,800
148	2,800	5,800
149	3,200	3,100

(vii)　Factory overhead is charged at 60% of direct wages.

Solution (i) :

Dr.　　　　　　　　**Stores Ledger Control A/c**　　　　　　*Cr.*

	Rs.		Rs.
To Balance b/f	8,700	By Work-in-progress Control A/c	14,400
,, Cost Ledger Control A/c	12,200	,, Factory Overhead Control A/c	2,000
,, Work-in-progress Control A/c	300	,, Balance c/f	4,800
	21,200		21,200

Dr.   **Work-in-progress Control A/c**   Cr.

	Rs.		Rs.
To Balance b/f	22,300	By Stores Ledger Control A/c	300
,, Stores Ledger Control A/c	14,400	,, Cost of Sales A/c*	
,, Wages Control A/c	28,000	(Cost of Completed jobs	
,, Factory Overhead Control A/c		transferred)	46,280
(60% of wages)	16,800	,, Balance c/f	34,920
	81,500		81,500

[*Total Costs of Job No. 135, 141 and 143 (Rs. 46,280) as per Job Accounts in Subsidiary Ledger.]

Dr.   **Wages Control A/c**   Cr.

	Rs.		Rs.
To Cost Ledger Control A/c		By Work-in-progress Control A/c	28,000
(28,000 + 7,000)	35,000	,, Factory Overhead Control A/c	7,000
	35,000		35,000

Dr.   **Factory Overhead Control A/c**   Cr.

	Rs.		Rs.
To Stores Ledger Control A/c	2,000	By Work-in-progress Control A/c	16,800
,, Wages Control A/c	7,000	,, Balance c/f	200
,, Cost Ledger Control A/c :			
Factory Indirect exp. 3,600			
Staff Welfare exp. 4,400	8,000		
	17,000		17,000

Dr.   **Cost of Sales A/c**   Cr.

	Rs.		Rs.
To Work-in-progress Control A/c	46,280	By Costing Profit & Loss A/c (cost of completed jobs transferred)	46,280
	46,280		46,280

Dr.   **Costing Profit & Loss A/c**   Cr.

	Rs.		Rs.
To Cost of Sales A/c	46,280	By Cost Ledger Control A/c (Sales value of jobs completed)	48,150
,, Cost Ledger Control A/c (Net Profit transferred)	1,870		
	48,150		48,150

Dr.   **Cost Ledger Control A/c**   Cr.

	Rs.		Rs.
To Costing Profit & Loss A/c	48,150	By Balance b/f	31,000
,, Balance c/f	39,920	,, Stores Ledger Control A/c	12,200
		,, Wages Control A/c	35,000
		,, Factory Overhead Control A/c	8,000
		,, Costing Profit & Loss A/c (Net Profit)	1,870
	88,070		88,070

	Trial Balance *as at 31. 1. '84*	*Dr.* Rs.	*Cr.* Rs.
Stores Ledger Control A/c		4,800	
Work-in-progress Control A/c		34,920	
Factory Overhead Control A/c (under recovery)		200	
Cost Ledger Control A/c		—	39,920
		39,920	39,920

(ii) Subsidiary Job Cost Ledger

Dr.   Job (No. 135) A/c   *Cr.*

	Rs.		Rs.
To Balance b/f	6,150	By Cost of Sales c/d	10,650
„ Materials	500		
„ Wages	2,500		
„ Factory overhead (60% of wages)	1,500		
	10,650		10,650
To Cost of Sales b/d	10,650	By Sales	12,500
„ Profit	1,850		
	12,500		12,500

Dr.   Job (No. 141) A/c   *Cr.*

	Rs.		Rs.
To Balance b/f	5,200	By Cost of Sales c/d	15,160
„ Materials	2,600		
„ Wages	4,600		
„ Factory overhead (60% of wages)	2,760		
	15,160		15,160
To Cost of Sales b/d	15,160	By Sales	18,850
„ Profit	3,690		
	18,850		18,850

Dr.   Job (No. 143) A/c   *Cr.*

	Rs.		Rs.
To Balance b/f	8,750	By Cost of Sales c/d	20,470
„ Materials	1,800		
„ Wages	6,200		
„ Factory overhead (60% of wages)	3,720		
	20,470		20,470
To Cost of Sales b/d	20,470	By Sales	16,800
		„ Loss	3,670
	20,470		20,470

Dr.   **Job (No. 144) A/c**   *Cr.*

	Rs.		Rs.
To Balance b/f	2,200	By Materials	300
,, Materials	3,500	,, Balance c/f	14,680
,, Wages	5,800		
,, Factory overhead (at 60% of wages)	3,480		
	14,980		14,980

Dr.   **Job (No. 148) A'c**   *Cr.*

	Rs.		Rs.
To Materials	2,800	By Balance c/f	12,080
,, Wages	5,800		
,, Factory overhead (at 60 % of wages)	3,480		
	12,080		12,080

Dr.   **Job (No. 149) A/c**   *Cr.*

	Rs.		Rs.
To Materials	3,200	By Balance c/f	8,160
,, Wages	3,100		
,, Factory overhead (at 60% of wages)	1,860		
	8,160		8,160

```
                                           Rs.
[Total Cost of Jobs Completed— Job No. 135  10,650
                          ,,    ,,   141  15,160
                          ,,    ,,   143  20,470
                                           46,280

Total Cost of Jobs yet to be completed—
                          Job No. 144  14,680
                          ,,    ,,   148  12,080
                          ,,    ,,   149   8,160
                                           34,920   (This     agrees
                                           with the Work-in-progress
                                           Control A/c balance)]
```

CONTRACT COSTING

Contract costing is a variant of Job Costing System applicable particularly in case of organisations doing construction work. It is also known as *Terminal Costing*. Each contract, short-term or long-term, is treated as a Job. It is understood from commonsense that costruction work involves massive investment and labour employment. So, it is not possible for any organisation to undertake a large number of contracts at a time.

The principles involved in contract costing are the same as those involved in job costing. Certain modifications are to be made in the principles, in some cases, to suit the requirements of particular contracts.

Inspite of same principles, *contract costing differs from job costing on same points mentioned below* :

(*a*) Number of jobs in hand at a time may be much greater than the number of contracts in hand at a time.

(*b*) Most of the items of expenses are capable of being *directly charged* to contract accounts : but direct charging to that extent is not possible in case of jobs.

(*c*) Collection, analysis, apportionment or allocation of cost is simpler in contract costing than in job costing.

(*d*) In case of contracts taking a number of years to complete, the question of assessment of profit at the end of each financial year crops up. This question does not arise in case of job costing.

(*e*) Normally, contracts are executed outside the factory, i.e., at customer's site ; but jobs are executed within the factory.

It has been already mentioned that a contract is treated as a job. So, contract constitutes the *cost unit* for the purpose of ascertainment of costs. For each contract a separate Contract Account is maintained for the purpose of ascertaining the total cost of the contract and profit or loss thereon.

Special features and problems involved

(*i*) *Materials* : Materials may be supplied from central stores or materials may be purchased exclusively for the contract. When materials are purchased exclusively for a contract all expenses of purchase are charged to the respective contract account. For all materials returned the contract account gets credit. Sometimes surplus materials may be transferred to another contract through *material transfer note* owing to economy in transport cost. For such transfer, contract receiving the material is debited and the contract transferring the material is credited.

If any surplus material does not become consumable by any other contract in near future, the same may be sold at the site. The proceeds of materials so sold is credited to the contract account and at the same time, any profit or loss on such sale is transferred to Profit & Loss account. Where the contractee supplies materials, cost of such material does not find place in contract account ; but the contractor often charges to the contractee a certain percent of the value of such materials as *handling charge* which, in that case, is added to the contract price for credit to the contract account.

Materials on site at the end of the financial year to be used in the next period, is to be credited to the contract account, debit being given to *Materials on site account*. This entry is reversed at the beginning of the next year.

(*ii*) *Wages* : Since contracts are executed at separate sites, the wages paid to workers engaged on each site can be directly charged to the respective contract account. The wages which cannot be charged directly to any contract are treated as indirect wages which require apportionment.

Workers may be frequently transferred from one contract to another. In this case, detailed time records are to be kept so that time spent on each contract can be known and wages charged accordingly.

Accrued wages as on the closing date is debited to contract account. This is brought down on the credit side of contract account at the beginning of the next period in case of an incomplete contract.

(*iii*) *Plant and Tools on site* : These can be treated in different ways —

(*a*) Cost of plant & tools sent to a contract may be debited to the contract account and credited to Plant & Tools Account, and on completion, the then depreciated value of plant and tools may be debited to Plant & Tools Account and credited to the Contract Account. If the contract is carried beyond the end of financial year, the depreciated value of the plant & tools as at the end of the financial year is ascertained and it is debited to *Plant & Tools on site Account* and credited to contract account. This entry is necessary to arrive at the total cost up to the end of the year ; it is however reversed at the beginning of the next financial year.

(*b*) Hourly rate of the plant may be ascertained by dividing the total of depreciation, operating expenses, wages of operators etc. by the total estimated working hours of the plant. The total hours. for which each contract engages the plant, decide the amount on the basis of hourly rate, to be charged to the contract account in respect of the use of the plant. In case, a plant is hired for a contract, the hire charge is debited to contract account. When a plant is purchased exclusively for a contract, the entire cost is debited to the Contract Account. On the completion of the contract if such plant is sold, the sale proceeds should not be credited to the Contract Account, the depreciated value (reasonable rate being taken) should be credited to the Contract Account, debit being given to Special Plant A/c. The sale proceeds should be credited to Special Plant A/c. The difference between the depreciated value and the sale proceeds, being profit or loss on sale, should be transferred to Profit & Loss Account from Special Plant A/c. Alternatively, sale proceeds may be credited to Contract A/c and profit or loss on such sale (i.e., difference between depreciated value and sale proceeds) may be transferred to Profit & Loss A/c from Contract A c itself.

(*iv*) *Direct Charges* : Architect's fee, consultant's fee, insurance, electricity, security cost, hire charges of plant, sub-contractor's bill etc. are the items that can be directly charged to the respective contract account.

Accrued direct expenses are debited to contract account and carried over to the next period in case of incomplete contracts.

(*v*) *Indirect Charges* : It has been already stated that, most of the items can be directly charged to contract accounts. There are certain items like central stores expenses, office expenses, top supervision charges, miscellaneous expenses etc. which are to be treated as indirect charges to be apportioned to various contracts. A suitable basis of apportionment may be used. Such expenses are often apportioned on the basis of total expenditure incurred on various contracts during a year.

Accrued indirect expenses are debited to contract account and carried over to the next period in case of incomplete contract.

(*vi*) *Bill of sub-contractors* : Parts of large contracts are often done by third parties under sub-contracts. Sub-contract is a practice normally followed on the reasons of economy, specialised nature of work, want of capacity etc. The entire amount billed by sub-contractors and accepted by the contractor is debited to the respective contract account.

(*vii*) *Certificate of Completion* : In case of large contracts continuing for a number of years, works are completed stage by stage. Unless the contractee's architect (or surveyor or technical assessor) certifies a work to have been completed, the work is not taken as completed by the contractor. The contractor gets 'on account payment' from the contractee on the basis of the value of work certified as completed. The contractee does not pay the full value of the work certified as completed, but retains a certain percent under the terms of agreement. The amount so retained is called *retention money*.

Entries in contract accounts in respect of the value of work completed and money received may be done in two different ways—

(*a*) (i)   Contractee A/c Dr. (Actual payment)
        Retention money A/c Dr. (Amount retained)
           To Contract A/c (value of work certified)

    (ii)   Cash Dr. (Actual payment received)
           To Contractee A/c

(*b*) (i)   Contractee A/c Dr. (value of work certified)
           To Contract A/c

    (ii)   Cash Dr. (Actual payment received)
           To Contractee A/c

[In case of (*b*) the debit balance on Contractee A/c represents retention money.]

(*c*) (i)   Value Certified Dr.
           To Contract A/c (Memorandum entry for the value of work certified)

    (ii)   Cash Dr. (Actual payment received)
           To Contractee A/c

[In case of (*c*) Contractee A/c only gets credit for payments. On any date of financial closing the work-in-progress is shown in the Balance Sheet

subject to deduction, therefrom, the balance of contractee account. Only on full completion of work, the contractee account is debited and contract account is credited with the contract price.]

Method 'c' is normally applied.

(viii) *Retention Money* : Retention money represents that portion of the value of work certified as completed, which the contractee holds, under the terms of the contract, till the completion of the entire work or upto a date thereafter. Retention money offers safeguard to the contractee, because he can forfeit the amount if the contractor fails to fulfil any of the conditions laid down in the contract regarding quality of work, time of completion etc.

(ix) *Sub-standard work :* No sub-standard work gets certificate of completion from the contractee's architect. The cost of such work is debited to contract account as well. If, however, the contractee is prepared to accept the work after stipulated rectification, the cost of such rectification is also debited to contract account (but in a distinct manner so that it can be located). If the contractee is prepared to accept the work at reduced price, the certificate shall mention the price and the amount reduced shall be deducted from the contract price.

(x) *Additional work :* In course of the work the contractee often likes to make some additions to the work. In this case a price quotation should be prepared for the additional work and it should be approved by the contractee. The original contract should be ammended accordingly or a fresh contract for the additional work should be entered into.

(xi) *Escalation and De-escalation or Reserve Clause :* If there is any possibility that the price of material and/or rate of labour may increase in future, or the utilization of material and/or labour may be more than what has been only roughly estimated, the contractor reserves the right of enchancing the contract price on the happening of any of the specified contingency, by virtue of a clause provided in the contract deed. This clause is called *Escalation Clause.* Similar safeguard to the contractee may also be provided against possible fall in the material and/or labour rates and utilization, by another clause called *De-escalation or Reserve Clause.*

(xii) *Work-in-progress :* Until the entire work is completed the work is termed *"Work-in-progress".* Work-in-progress has to be valued at the end of each financial year. The mode of valuation depends upon the requirements of the contract account as explained below :

(a) If the contract account is required to show the profit or loss to be transferred to Profit & Loss Account, the Work-in-progress shall be valued as :

Cost of work certified *plus* cost of work not yet certified including incomplete work *plus* profit to be included in Profit & Loss Account (or *less* loss to be transferred to Profit & Loss Account).

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(b) If the contract account is required to show the total profit earned during the year, the Work-in-progress shall be valued as :

Value of work certified *plus* **cost** of work not yet certified including incomplete work.

> *Note :* In case of (*a*) the value of Work-in-progress does not include *profit not taken* to Profit & Loss Account ; while in case of (*b*) the value of Work-in-progress includes *profit not taken* to Profit & Loss Account and as such it is to be reduced by deducting therefrom *the profit not taken to Profit and Loss Account* for the purpose of Balance Sheet.

Value of Work-in-progress in respect of work certified and value of Work-in-progress in respect of work completed but not certified as well as work done but not yet completed should be shown in the Balance Sheet distinctly under two heads "*Certified Work-in-progress*" and "*Uncertified Work-in-progress.*"

(*xiii*) *Profit or loss on Contracts not yet completed :* Profit or loss in respect of each contract during every financial year can be ascertained. The question is, as to whether such profit or loss or any portion thereof, should be transferred to the Profit and Loss Account of the year concerned.

While there is no controversy as to the treatment of loss on uncompleted contract (which is transferred to Profit and Loss Account entirely) there is a controversy as to the treatment of Profit on uncompleted contract.

The most conservative approach is that, no *profit* on any contract should be considered for the purpose of Profit & Loss Account unless such contract is completed. The loss on incomplete contract in any year should, however, be transferred to the year's Profit & Loss Account. So, on conservative approach the Work-in-progress is valued at cost only. No portion of profit, if any, is included in the value of Work-in-progress. The arguments in favour of this approach are—

(*a*) Until a contract is completed, no body can say that, ultimately there will be profit. So profit in any year before completion is nothing but anticipated profit. Anticipation of profit is contrary to normal accounting principles.

(*b*) If profit is considered, income-tax shall be payable on that profit much earlier than the year of completion.

(*c*) A contract may show profit during earlier years of execution, but ultimately it may prove loss. Dividends paid on the basis of profit in earlier years shall be unjustified.

If no profit is transferred to Profit & Loss Account before the contracts are completed it will be seen that—

(*a*) In some years there will be dirth of profits and in some other years, when many contracts shall be completed, there will be too much profit. So profit shall highly fluctuate from year to year rendering it difficult to maintain the dividend rate.

(*b*) Profit in the year of completion, being transferred to that year's Profit & Loss Account, shall appear as if all the profits have been earned in that year only. Does it represent the true trading result ?

Thus, in the practical field, profit on incomplete contracts is also considered for the purpose of Profit & Loss Account subject to some restrictions.

The *guidelines* in this regard are as below :

(1) If the contract is only at the initial stage or the contract has not substantially advanced (say, even upto 25% of the total work), no profit should be credited to Profit & Loss Account ; because it is too early to anticipate profit with reasonable correctness.

(2) If the contract has progressed substantially (say above 25% of the whole work), one-third to two-thirds of the profit *on cash basis in respect of only the work certified* should be credited to the year's Profit & Loss Account [That proportion of the profit as the value of work certified bears to the contract price, may also be credited to Profit & Loss Account.]

> *Note :* Conventionally, one-third of the profit is considered if the work is completed above 25%, but below 50% ; and two-thirds of the profit is considered if the work is completed to the extent of 50% or more.

(3) If the contract is almost completed so much so that the further cost required to complete may be estimated, the profit at the point of completion should be estimated and that proportion of the estimated profit may be credited to Profit & Loss Account of the year as the value of work certified (as on the closing date) bears to the total value of the contract.

It should be noted in this connection that in case of a short-term contract (i.e., a contract which requires less than a year to complete), no profit should be taken into consideration until the contract is completed. Hence, if such a contract remains incomplete as on the closing date of any accounting year, the work-in-progress should be valued 'at the lower of cost and net realisable value.' Consequently, the entire amount of profit should be credited to the profit and loss account of the year in which the contract is completed.

Loss on incomplete contract *should always be transferred, in full, to Profit & Loss Account* of the year concerned.

Profit on Cash Basis :

If a contract shows a profit of, say, Rs. 10,000, in any year and the contractor receives cash equivalent to 80% of the value certified (20% being retention) the profit on cash basis shall be—

$$\frac{80}{100} \times Rs. \ 10,000 \quad \text{or} \quad Rs. \ 8,000$$

Cost Plus Contracts :

Where the contractee agrees to pay the contractor, as contract price, the exact cost plus certain percent thereof to cover overhead expenses and profit, the contract is called *cost plus contract.*

In case of *new type of work* where the contractor can not estimate the cost due to lack of experience in the line, cost plus contract, is generally entered into. Government contracts are often on cost plus contract basis.

Since in these contracts the contractor is assured of reimbursement of actual cost, there is no initiative on the part of the contractor to economise. Higher cost means higher profit. So the contractor is interested in higher cost. On the part of the contractee, therefore, higher supervision cost is involved. The fixed percentage of margin allowed sometimes becomes inadequate and sometimes it becomes excessive.

Illustration 1.

Two contracts commenced on 1st January and 31st July, 1988 respectively, were undertaken by a contractor and their accounts on 31st Dec., 1988 showed the following position :

	Contract	Contract B
	Rs.	Rs.
Contract Price	40,000	27,000
Expenditure :		
Materials	7,200	5,800
Wages paid	11,000	11,240
General charges	400	280
Plant installed	2,000	1,600
Materials on hand	400	400
Wages accrued	400	400
Work certified	20,000	16,000
Cash received in respect thereof	15,000	12,000
Cost of work done but not yet certified	600	800

Plants were installed on the date of commencement of each contract. Depreciation is chargeable @ 10% p.a. Prepare the Contract Accounts in columnar form showing the profit or loss to be transferred to Profit and Loss Account for the year ended 31st Dec., 1988. (*C. U., B. Com.—Adapted*)

Solution :

Workings—

	Contract A	Contract B
	Rs.	Rs.
Materials	7,200	5,800
Wages paid	11,000	11,240
General charges	400	280
Wages accrued	400	400
Depreciation on Plant	200	80
Total expenditure to date	19,200	17,800
Less : Materials on hand	400	400
Net expenditure to date	18,800	17,400
Less : Cost of uncertified work	600	800
Cost of work certified	18,200	16,600
Value of work certified	20,000	16,000
profit/(loss)	1,800	(600)

Contract '*B*' has shown a loss of Rs. 600 which should be entirely transferred to Profit and Loss A/c. Contract '*A*' has shown a profit of Rs 1,800. Total contract price is Rs. 40,000, value of work certified is Rs. 20,000. So, 50% of the work has been certified as completed. Two-thirds of the profit on cash basis may be reasonably credited to Profit and Loss Account as calculated below :

$$\frac{2}{3} \times \frac{15,000}{20,000} \times \text{Rs. } 1,800 = \text{Rs. } 900.$$

Valuation of Work-in-progress

	Contract *A* Rs.	Contract B Rs.
Cost of work certified	18,200	16,600
Cost of work uncertified	600	800
	18,800	17,400
Add profit taken to P & L A/c	900	—
Less Loss transferred to P & L A/c	—	600
Work-in-Progress	19,700	16,800

Dr.   **Contract Accounts**   **Cr.**

	Contract A	Contract B		Contract A	Contract B
31-12-88	Rs.	Rs.	31-12-88	Rs.	Rs.
To Materials Issued	7,200	5,800	By Materials on hand c/d	400	400
„ Wages paid	11,000	11,240	„ Plant on Site c/d	1,800	1,520
„ General Charges	400	280	„ Profit & Loss A/c	–	600
„ Plant A/c	2,000	1,600	- loss transferred		
„ Accrued Wages c/d	400	400	„ Work-in-progress c/d	19,700	16,800
„ Profit & Loss A/c	900				
— profit transferred					
	21,900	19,320		21,900	19,320
1-1-89			1-1-89		
To Materials on hand b/d	400	400	By Accrued Wages b/d	400	400
„ Plant on Site b/d	1,800	1,520			
„ Work-in-progress b/d	19,700	16,800			

Note :   1. Plant on site = Cost of Plant less depreciation.

Illustration 2.

An expenditure of Rs. 1,94,000 has been incurred on a contract to the end of March, 1988. The value of work certified is Rs. 2,20,000. The cost of work done but not yet certified is Rs. 6,000. It is estimated that the contract will be completed by 30th June, 1988 and an additional expenditure of Rs. 40,000 will have to be incurred to complete the contract. The total estimated expenditure on the contract is to include a provision of $2\frac{1}{2}\%$ for contingencies. The contract price is Rs. 2,80,000 and Rs. 2,00,000 has been realised in cash upto 31st March, 1988. Calculate the proportion of profit to be taken to the Profit and Loss Account for the year ended 31st March, 1988 under different methods.

Solution :

	Rs.
Expenditure upto 31st March, 1988	1,94,000
Less : Cost of uncertified work	6,000
Cost of certified work	1,88,000
Value of certified work	2,20,000
Notional Profit	32,000

Profit to be taken to Profit & Loss Account :

(As more than 50% of the work has been completed, two-thirds of profit may be considered.)

1st method : 2/3rds of Profit on Cash Basis

$$\frac{2}{3} \times \frac{\text{Rs. } 2,00,000}{\text{Rs. } 2,20,000} \times \text{Rs. } 32,000 \text{ or Rs. } 19,394 \text{ (approx.)}$$

2nd method : Proportion of profit as the value of work certified bears to the contract price.

$$\text{Rs. } 32,000 \times \frac{\text{Value of work certified}}{\text{Contract Price}}$$

$$\text{or, Rs. } 32,000 \times \frac{\text{Rs. } 2,20,000}{\text{Rs. } 2,80,000} = \text{Rs. } 25,143 \text{ (approx.)}$$

3rd method :

	Rs.
Expenditure upto 31st March, 1988	1,94,000
Add : Estimated further cost to complete	40,000
97½% *of the total cost*	2,34,000
Add : 2½% for contingencies : $\frac{2\frac{1}{2}}{97\frac{1}{2}} \times$ Rs. 2,34,000	6,000
Estimated total cost (100%)	2,40,000
Contract price	2,80,000
Estimated profit on completion	40,000

Profit to be taken to Profit & Loss Account—

$$\text{Rs. } 40,000 \times \frac{\text{Rs. } 2,20,000}{\text{Rs. } 2,80,000} = \text{Rs. } 31,429 \text{ (approx.)}$$

*This profit may be further reduced, taking into consideration the proportion of cash received to value of work certified, as follows :

$$\text{Rs. } 31,429 \times \frac{\text{Rs. } 2,00,000}{\text{Rs. } 2,20,000} = \text{Rs. } 28,572 \text{ (approx.)}$$

WORKED-OUT PROBLEMS

Problem 1.

The following amounts have been spent on a contract still unfinished on 31st December, 1988 :

	Rs.
Materials sent to site	85,349
Labour engaged on site	74,375

	Rs.
Plant installed at site at cost	15,000
Direct expenditure	3,167
Establishment charges	4,126
Materials returned to store	549
Work certified	1,95,000
Cost of work not yet certified	4,500
Materials in hand, 31st December	1,883
Wages accrued due at 31st December	2,400
Direct expenditure accrued due at 31st December	240
Value of plant at 31st December	11,000

The contract price has been agreed at Rs. 2,50,000 and cash has been received from the contractee amounting to Rs. 1,80,000.

Prepare (i) Contract Account, and (ii) Contractee's Account.

Show (i) the calculation of profit which should be credited to Profit & Loss Account, and (ii) total value of Work-in-progress with breakup.

Also show how the relevant items will appear in the Balance Sheet as at 31.12.88. (*C. U., B. Com. Hons.—Adapted*)

Solution

Dr. Contract No........A'c *Cr.*

	Rs.		Rs.
To Materials	85,349	By Materials returned to store	549
„ Labour	74,375	„ Materials at site c/d	1,883
„ Plant installed at site	15,000	„ Plant at site c/d	11,000
„ Direct Expenditure	3,167		13,432
„ Establishment charges	4,126	Work-in-progress c/d¹	1,88,625
„ Accrued Expen es c/d :			
Wages	2,400		
Direct Expenditure	240		
	1,84,657		
„ Profit & Loss A/c¹—proportion of profit transferred	17,400		
	2,02,057		2,02,057
To Materials at site b/d	1,883	By Accrued Expenses b/d :	
„ Plant at site b/d	11,000	Wages	2,400
„ Work-in-progress b/d	1,88,625	Direct Expenditure	240

Working Notes :

¹Calculation of profit and its proportion to be taken to the credit of Profit & Loss A/c—

		Rs.
(1)	Accounting profit :	
	Total amount debited to Contract A/c to date	1,84,657
	Less : Total amount credited to Contract A/c to date	13,432
	Net expenditure to date	1,71,225
	Less : Cost of work not certified	4,500
	Cost of work certified	1,66,725
	Value of work certified	1,95,000
	Accounting profit	28,275

(2) Profit on realised basis : $\dfrac{1,80,000}{1,95,000} \times$ Rs. 28,275 = Rs. 26,100

(3) Proportion to be taken to Profit & Loss A/c :
$\frac{2}{3} \times$ Rs. 26,100 = Rs. 17,400

²Calculation of Work-in-progress :	Rs.
Cost of work certified as above	1,66,725
Cost of work not yet certified	4,500
Profit taken to P & L A/c as above	17,400
	1,88,625

Alternative method

Dr.		Contract No........A/c		Cr.
31-12-88	**Rs.**	**31-12-88**		**Rs.**
To Materials	85,349	By Materials returned to store		549
„ Labour	74,375	„ Materials at site c/d		1,883
„ Plant installed at site	15,000	„ Plant at site c/d		11,000
„ Direct Expenditure	3,167	„ Balance c/d		
„ Establishment Charges	4,126	—cost to date		1,71,225
„ Accrued Expenses c/d :				
Wages	2,400			
Direct Expenditure	240			
	1,84,657			1,84,657
To Balance b/d	1,71,225	By Work-in-progress c/d		
		—cost of work not certified		4,500
		„ Balance c/d		
		— cost of work certified		1,66,725
	1,71,225			1,71,225
To Balance b/d	1,66,725	By Work-in-progress c/d		
„ Profit & Loss A/c—propor-		—value of work certified		1,95,000
tion of profit transferred¹	17,400			
„ Work-in-progress c/d				
—provision	10,875			
	1,95,000			1,95,000
1-1-89		**1-1-89**		
To Materials at site b/d	1,883	By Accrued Expenses b/d :		
„ Plant at site b/d	11,000	Wages		2,400
„ Work-in-progress b/d:-		Direct Expenditure		240
Cost of work not				
certified	4,500			
Value of work				
certified	1,95,000			
	1,99,500			
Less.: Provision	10,875			
	1,88,625			

Working Notes :
¹Calculation of the proportion of profit to be taken to the credit of Profit & Loss A/c
(1) Accounting profit : Rs. (1,95,000−1,66,725)=Rs. 28,275
(2) Profit on realised basis : $\dfrac{1,80,000}{1,95,000} \times$ Rs. 28,275 = Rs. 26,100

(3) Proportion to be taken to the credit of Profit & Loss A/c :
$\frac{2}{3} \times$ Rs. 26,100 = Rs. 17,400.

Dr.   **Contractee's A/c**   Cr.

	Rs.		Rs.
To Balance c/f	1,80,000	By Cash	1,80,000

(Extracts from) Balance Sheet *as at 31.12.88*

Liabilities	Rs.	*Assets*		Rs.
Profit & Loss A/c (will include) Profit on Contract No......	17,400	Plant at site at cost 15,000 Less : Depreciation 4,000		11,000
Creditors of expenses— Wages accrued 2,400 Direct expenses accrued 240	2,640	Materials at site Work-in-progress 1,88,625 Less : Cash received on account 1,80,000		1,883 8,625

[*Note* : Balance Sheet under the alternative method shall show the Work-in-progress as below :

Work-in-progress (work certified)+work-in-progress (work not yet certified) less Provision on Profit less amount received from the contractee. The figure will be 'the same i.c., Rs. 8,625.]

Problem 2.

On 1st April, 1988 Contractors Ltd. started work on contract No. 534 for the construction of a barrage for a contract price of Rs. 1,80,00,000. Budgeted cost of the contract was Rs. 1,50,00,000. The particulars in regard to the contract for the year ended 31st March, 1989, were as follows :

	Rs.
Materials issued to the contract	30,00,000
Materials returned to stores	75,000
Materials in hand	1,80,000
Wages	60,00,000
Plant at cost (to be depreciated @ 20 per cent)	5,00,000
Direct expenditure	90,000
General overhead (allocated to the contract)	75,000
Cost of completed work yet to be certified	6,00,000

Up to the close of the period a total sum of Rs. 86,40,000 being 90 per cent of the certified amount was received.

Prepare the Contract Account showing the profit or loss on the contract during the period.

Solution

Contractors Ltd.

Dr.   Contract No. 534 A/c   Cr.

31-3-89	Rs.	31-3-89	Rs.
To Materials	30,00,000	By Materials returned to stores	75,000
,, Wages	60,00,000	,, Materials at site c/d	1,80,000
,, Plant	5,00,000	,, Plant at site c/d : 5,00,000	
,, Direct expenditure	90,000	*less* 20% thereof	4,00,000
,, General Overhead	75,000	,, Balance c/d - cost to date	90,10,000
	96,65,000		96,65,000
To Balance b/d	90,10,000	By Work-in-progress c/d	
		— cost of work not certified	6,00,000
		,, Balance c/d	
		—cost of work certified	84,10,000
	90,10,000		90,10,000
To Balance b/d	84,10,000	By Work-in-progress c/d	
,, Profit & Loss A/c -proportion		--value of work certified [1]	96,00,000
of profit transferred [2]	7,14,000		
,, Work-in-progress c/d			
—provision	4,76,000		
	96,00,000		96,00,000
1-4-89			
To Materials at site b/d	1,80,000		
,, Plant at site b/d	4,00,000		
,, Work-in-progress b/d			
Cost of work not			
yet certified 6,00,000			
Value of work			
certified 96,00,000			
1,02,00,000			
Less : Provision 4,76,000	97,24,000		

Working Notes :

[1] Calculation of value of work certified : $\frac{100}{90} \times$ Rs. 86,40,000 - Rs. 96,00,000.

[2] Calculation of proportion of profit to be taken to the credit of Profit & Loss A/c—

(1) Accounting Profit : Rs. (96,00,000−84,10,000) or Rs. 11,90,000.

(2) Profit on realised basis : $\frac{90}{100} \times$ Rs. 11,90,000—Rs. 10,71,000.

(3) Proportion to be taken to the credit of Profit & Loss A/c :

$\frac{2}{3} \times$ Rs. 10,71,000 = Rs. 7,14,000.

Problem 3.

Builders Ltd. was awarded a contract to build an office block in Calcutta and work commenced at the site on 1st May, 1988.

During the period to 28th February, 1989, the expenditure on the contract was as follows :

	Rs.
Materials issued from stores	94,110
Materials purchased	2,80,700
Direct expenses	61,490
Wages	1,84,930

Rs.

Charge made by the company of administration expenses 21,460

Plant and Machinery purchased on 1st May, 1988

       for use at site 1,21,800

On 28th February, 1989, the stock of materials at the site amounted to Rs. 21,640 and there were amounts outstanding for wages Rs. 3,660 and direct expenses Rs. 490.

Builders Ltd. has received on account the sum of Rs. 6,41,700 which represents the amount of certificate No. 1 issued by architects in respect of work completed to 28th February, 1989, after deducting 10% retention money.

The following relevant information is also available :

(*a*) the plant and machinery has an effective life of 5 years with no residual value, and

(*b*) the company only takes credit for two-thirds of the profit on work certified.

You are required :

  (i) to prepare a contract account for the period to 28th February, 1989, and

  (ii) to show your calculation of the profit to be taken to the credit of the company's Profit & Loss Account in respect of the work covered by certificate No. 1.   *(C. U., B. Com. Hons.)*

Solution

Dr.   **Contract No........A/c**   *Cr.*

28-2-89	Rs.	28-2-89	Rs.
To Materials		By Materials at site c/d	21,640
—issued from stores	94,110	„ Plant & Machinery at	
—purchased	2,80,700	site c/d¹	1,01,500
„ Wages	1,84,930	„ Balance c/d —	
„ Direct expenses	61,490	cost to date being cost of	
„ Plant & Machinery	1,21,800	work certified²	6,45,500
„ Administration expenses	21,460		
„ Outstanding expenses c/d			
—Wages	3,660		
—Direct expenses	490		
	7,68,640		7,68,640
To Balance b/d		By Work-in-progress c/d	
—cost of work certified³	6,45,500	—value of work certified³	7,13,000
„ Profit & Loss A/c—proportion			
of profit transferred⁴	40,500		
„ Work-in-progress c/d			
—provision	27,000		
	7,13,000		7,13,000
1-3-89		1-3-89	
To Materials at site b/d	21,640	By Outstanding Expenses b/d	
„ Plant & Machinery at site b/d	1,01,500	—Wages	3,660
„ Work-in-progress b/d :		—Direct expenses	490
Value of work			
certified 7,13,000			
Less : Provision 27,000			
	6,86,000		

Working Notes :

¹Value of Plant & Machinery at site :

Annual depreciation $= \dfrac{\text{Rs. } 1,21,800}{5} =$ Rs. 24,360

	Rs.
Cost of Plant & Machinery	1,21,800

Less : Depreciation for 10 months (from 1-5-88 to 28-2-89) :

Rs. 24,360 × ¹⁰⁄₁₂	20,300
	1,01,500

²Cost to date is the cost of work certified, because there is no uncertified work.

³Value of work certified :

Cash received Rs. 6,41,700 represents 90% of tne value of work certified. Hence the value of work certified $= \dfrac{100}{90} \times$ Rs. 6,41,700 = Rs. 7,13,000.

⁴Proportion of profit to be transferred to P/L A/c :

(1) Accounting profit : Rs. (7,13,000 − 6,45,500) = Rs. 67,500.

(2) Profit on realised basis : $\dfrac{90}{100} \times$ Rs. 67,500 = Rs. 60,750.

(3) Proportion to be taken to the credit of P/L A/c : $\dfrac{2}{3} \times$ Rs. 60,750 = Rs. 40,500.

Problem 4.

The following information relates to a building contract for Rs. 10,00,000 and for which 80% of the value of Work-in-progress as certified by the architect is being paid by the contractee.

	1st Year Rs.	2nd Year Rs.	3rd Year Rs.
Materials issued	1,20,000	1,45,000	84,000
Direct wages	1,10,000	1,55,000	1,10,000
Direct expenses	5,000	17,000	6,000
Indirect expenses	2,000	2,600	500
Work certified	2,35,000	7,50,000	10,00,000
Uncertified work	3,000	8,000	—
Plant issued	14,000	—	—
Materials on site	2,000	5,000	8,000

The value of the plant at the end of 1st, 2nd and 3rd years were Rs. 11,200, Rs. 7,000 and Rs. 3,000 respectively. Prepare Contract Account for these three years taking into account such profit as you think proper on incomplete contract.

(Delhi, B. Com.)

Solution :

Dr.   **Contract No........Account**   *Cr.*

	Rs.		Rs.
1st year		1st year	
To Materials	1,20 000	By Materials at site c/d	2,000
,, Direct wages	1,10,000	,, Plant at site c/d	11,200
,, Direct expenses	5,000	.. Work-in-progress c/d	
,, Indirect expenses	2,000	—uncertified work	3,000
,, Plant	14,000	—certified work	2,35,000
,, Balance c/d	200		
	2,51,200		2,51,200
To Work-in-progress c/d		By Balance b/d	200
—provision[1]	200		
	200		200
2nd year		2nd year	
To Materials at site b/d	2,000	By Work-in-progress b/d	
,, Plant at site b/d	11,200	-provision	200
,, Work-in-progress b/d		,, Materials at site c/d	5,000
—uncertified work	3,000	,, Plant at site c/d	7,000
—certified work	2,35,000	.. Work-in-progress c/d	
,, Materials	1,45,000	—uncertified work	8,000
,, Direct wages	1,55,000	-certified work	7,50,000
,, Direct expenses	17,000		
,, Indirect expenses	2,600		
,, Balance c/d	1,99,400		
	7,70,200		7,70,200
To Profit & Loss A/c[2]	1,06,347	By Balance b/d	1,99,400
,, Work-in-progress c/d			
-provision	93,053		
	1,99,400		1,99,400
3rd year		3rd year	
To Materials at site b/d	5,000	By Work-in-progress b/d	
,, Plant at site b/d	7,000	-provision	93,053
,, Work-in-progress b/d		,, Contractee A/c	10,00,000
—uncertified work	8,000	,, Materials returned to store	8,000
—certified work	7,50,000	,, Plant returned	3,000
,, Materials	84,000		
,, Direct wages	1,10,000		
,, Direct expenses	6,000		
,, Indirect expenses	500		
,, Profit & Loss A/c[3]	1,33,553		
	11,04,053		11,04,053

Working Notes :

[1]In the 1st year no profit has been transferred to P/L A/c, because the amount is negligible and work certified is less than ¼th of the total contract price. The amount of profit has, therefore, been carried forward as provision.

[2]Profit credited to P/L A/c in the 2nd year : Rs. $1,99,400 \times \frac{10}{100} \times \frac{2}{3} = $ Rs. 1,06,347.

[3]In the 3rd year no provision is necessary and the entire profit has been transferred to P/L A/c, because the entire work has been completed and certified. The materials and plants at site are also returned on completion of work in the third year.

lowing are the particulars in respect of Contract No. B83 for
...d 31.12.89. Prepare Contract A/c.

	Rs.
Materials sent to site	1,50,000
Wages paid	1,80,000
Wages unpaid	3,000
Other expenses	26,000
Plant sent to site	2,00,000
Materials returned stores	5,000
Materials lying unconsumed	8,000
Materials stolen from site	10,000
Insurance claim admitted for materials stolen	7,000
Work uncertified	11,000
Cash received	3,60,000

Plant is subject to depreciation @ $7\frac{1}{2}\%$ p.a. and cash has been received to the extent of 90% of work certified. (*C. U., B. Com. Hons.—adapted*)

Solution :

Dr.   Contract No. B83 Account   Cr.

31-12-89		Rs.	31-12-89	Rs.
To Materials		1,50,000	By Materials returned to stores	5,000
„ Wages		1,80,000	„ Materials at site c/d	8,000
„ Other expenses		26,000	„ Plant at site c/d . Rs. 2,00,000	
„ Plant sent to site		2,00,000	less $7\frac{1}{2}\%$ thereof	1,85,000
„ Wages unpaid c/d		3,000	„ Insurance claim admitted	7,000
			„ Profit & Loss A/c	
			—loss of materials not	
			covered by insurance	3,000
			„ Balance c/d—cost to date	3,51,000
		5,59,000		5,59,000
To Balance b/d		3,51,000	By Work-in-progress c/d	
			—cost of uncertified work	11,000
			„ Balance c/d	
			—cost of certified work	3,40,000
		3,51,000		3,51,000
To Balance b/d		3,40,000	By Work-in-progress c/d	
„ Profit & Loss A/c— propor-			—value of work certified	4,00,000
tion of profit transferred		36,000		
„ Work-in-progress c/d				
—provision		24,000		
		4,00,000		4,00,000
1-1-90			1-1-90	
To Materials at site b/d		8,000	By Wages unpaid b/d	3,000
„ Plant at site b/d		1,85,000		
„ Work-in-progress b/d				
Cost of uncertified				
work	11,000			
Value of certified				
work	4,00,000			
	4,11,000			
Less : Provision	24,000	3,87,000		

Working Notes :

  ¹Value of work certified—

  $\frac{100}{90}$ × Rs. 3,60,000 = Rs. 4,00,000

  ²Proportion of profit to be transferred to P/L A/c—

  (1) Accounting profit : Rs. (4,00,000 − 3,40,000) = Rs. 60,000

  (2) Profit on realised basis : 90% of Rs. 60,000 = Rs. 54,000

  (3) Proportion to be transferred to P/L A/c : $\frac{2}{3}$ × Rs. 54,000 = Rs. 36,000.

Problem 6.

Erectors Ltd. took a contract for construction of a building for Rs. 12 lakh on 1st January, 1989. The following information is available from the records maintained by Erectors Ltd.

You are informed that it is the practice of the company to take credit for 60 per cent of the profit earned on the contracts in progress after taking into account the value of the work certified for payment by architect.

You are required to show the Contract Account and the Contractee's Account as on 31-12-1989 from the following data :

	Rs.
Direct materials issued	3,25,000
Direct labour	4,00,000
Special plant installed at cost	2,50,000
Establishment charges	75,000
Direct expenses	1,00,000
Work certified by architect	10,50,000
Cost of work not yet certified	50,000
Value of special plant as at 31-12-1989	2,00,000
Materials at site on 31-12-1989	25,000
Cash received from contractee	9,45,000

General plant costing Rs. 3,00,000 was used for 2 months, depreciation thereon is to be provided at 10% p.a. Materials costing Rs. 3,000 (being unsuitable for the work) was sold for Rs. 4,000. Besides, scraps were sold for Rs. 2,000.   (*C. A. Final—Adapted*)

Solution :

Erectors Ltd.

Dr.		*Contract No......A/c*		*Cr.*
31.12.89	Rs.	31.12.89		Rs.
To Direct Materials	3,25,000	By Cash—sales of materials		4,000
,, Direct Labour	4,00,000	,, Cash—sales of scraps		2,000
,, Special Plant	2,50,000	,, Plant at site c/d		2,00,000
,, Establishment charges	75,000	,, Materials at site c/d		25,000
,, Direct expenses	1,00,000	,, Balance c/d		
,, Depreciation on General		—cost to date		9,25,000
Plant (for 2 months)	5,000			
,, Profit & Loss A/c—profit on				
sale of materials	1,000			
	11,56,000			11,56,000
To Balance b/d	9,25,000	By Work-in-progress c/d		
		—cost of work not yet certified		50,000
		,, Balance c/d		
		—cost of work certified		8,75,000
	9,25,000			9,25,000
To Balance b/d	8,75,000	By Work-in-progress c/d		10,50,000
,, Profit & Loss A/c—proportion		—value of work certified		
of profit transferred¹	1,05,000			
Work-in-progress c/d	70,000			
—provision				
	10,50,000			10,50,000
1.1.90				
To Plant at site b/d	2,00,000			
,, Materials at site b/d	25,000			
,, Work-in-progress b/d				
Cost of work not				
yet certified 50,000				
Value of work				
certified 10,50,000				
11,00,000				
Less : Provision 70,000	10,30,000			

Dr.		**Contractee's A/c**		*Cr.*
	Rs.			Rs.
To Balance c/f	9,45,000	By Cash		9,45,000

Working Note :
   ¹Proportion of profit to be transferred to P/L A/c :
     $\frac{2}{3}\times\frac{90}{100}\times$ Rs. (10,50,000 − 8,75,000) = Rs. 1,05,000.

Problem 7.

    Calcutta Construction Ltd. undertook a contract for construction of a bridge on 1st July, 1988. The contract price was Rs. 5,00,000. The company incurred the following expenses upto 31st December, 1988.

	Rs.
Materials consumed	1,10,000
Wages	40,000
Direct Expenses	20,000

Plant Purchased on 1.7.88   1

Materials in hand

Depreciation 10% per annum on plant.

Charge other works expenses @ 20% of wages

         and office expenses @ 10% of works cost.

The amount certified by the engineer, was Rs. 3,00,000, retention money being 20% of the certified value.

Prepare the Contract Account showing therein the amount of profit that the company can reasonably take to its Profit & Loss Account.

(C. U., B. Com. Hons.—Adapted)

Solution :

Dr.   Contract No.........Account   *Cr.*

31-12-88	Rs.	31-12-88	Rs.
To Materials consumed'	1,10,000	By Work-in-progress c/d –	
., Wages	40,000	Value of work certified	3,00,000
., Direct expenses	20,000		
., Depreciation on plant			
(for 6 months)	5,000		
,, Other works expenses			
(20% of wages)	8,000		
Works cost	1,83,000		
Office expenses			
(10% of works cost)	18,300		
	2,01,300		
Profit & Loss A/c—proportion of profit transferred²	52,640		
Work-in-progress c/d —provision	46,060		
	3,00,000		3,00,000

1-1-89				
To Work-in-progress b/d				
Value of certified				
work	3,00,000			
Less : Provision	46,060	2,53,940		

Working Notes :

'The value of materials consumed has been given in the problem which has been debited to the Contract A/c. Hence materials in hand as on the closing date need not be considered for the purpose of the Contract Account.

²Proportion of profit to be transferred to P/L A/c—

(1) Accounting profit : Rs. (3,00,000−2,01,300)=Rs. 98,700.

(2) Profit on realised basis : 80% of Rs. 98,700= Rs. 78,960.

(3) Proportion to be transferred to P/L A/c : ⅔ × Rs. 78,960 =Rs. 52,640.

Problem 8.

M/s. Hind Corporation undertook a contract for erecting a plant for a total value of Rs. 24 lakh. It was estimated that the job would be completed by 31st January, 1989.

Cost (Part I)—29

You are required to prepare the Contract Account and the Work-in-progress Account for the year ended 31st January, 1988 from the following particulars :

(1) Materials—Rs. 3,00,000.

(2) Wages—Rs. 6,00,000.

(3) Overhead charges—Rs. 1,20,000.

(4) Special plant—Rs. 2,00,000.

(5) Work certified was for Rs. 16,00,000 and 80 per cent of the same was received in cash.

(6) Materials lying on site as on 31-1-88—Rs. 40,000.

(7) Depreciate plant by 10 per cent p.a.

(8) 5 per cent of the value of material issued and 6 per cent of the wages may be taken to have been incurred for the portion of work completed, but not yet certified. Overheads are charged as a percentage of direct wages.

(9) Ignore depreciation of plant for use on uncertified portion of the work.

(10) Ascertain the amount to be transferred to Profit & Loss Account on the basis of realised profit.

Solution :

<div align="center">

M/s. Hind Corporation

Contract No............A/c

</div>

Dr.   Cr.

31-1-88	Rs.	31-1-88	Rs.
To Materials	3,00,000	By Materials at site c/d	40,000
„ Wages	6,00,000	„ Plant at site c/d	1,80,000
„ Overhead charges	1,20,000	„ Balance c/d—cost to date	10,00,000
„ Plant	2,00,000		
	12,20,000		12,20,000
To Balance b/d	10,00,000	By Work-in-progress A/c —cost of uncertified work	58,200
		„ Balance c/d—cost of certified work	9,41,800
	10,00,000		10,00,000
To Balance b/d	9,41,800	By Work-in-progress A/c —value of certified work	16,00,000
„ Profit & Loss A/c—proportion of profit transferred	3,51,040		
„ Work-in-progress A/c —Provision	3,07,160		
	16,00,000		16,00,000
1-2-88			
To Materials at site b/d	40,000		
„ Plant at site b/d	1,80,000		
„ Work-in-progress A/c —transfer	13,51,040		

Dr. **Work-in-progress A/c** *Cr.*

31-1-88	Rs.	31-1-88	Rs.
To Contract No.........A/c		By Contract No.........A/c	
—cost of uncertified work	58,200	—provision	3,07,160
—value of certified work	16,00,000	., Balance c/d	13,51,040
	16,58,200		16,58,200
1-2-88		1-2-88	
To Balance b/d	13,51,040	By Contract No...A/c—transfer	13,51,040

Working Notes :

       ¹Calculation of the cost of uncertified work :   Rs.

         Materials : 5% of Rs. 3,00,000 (materials issued)   15,000

         Wages : 6% of Rs. 6,00,000   36,000

         Overhead : $\dfrac{1,20,000}{6,00,000} \times$ Rs. 36,000   7,200

                                             58,200

       ²Calculation of proportion of profit to be transferred to P/L A/c

        (1)   Accounting profit : Rs. (16,00,000 − 9,41,800) = Rs. 6,58,200

        (2)   Profit on realised basis : 80% of Rs. 6,58,200 = Rs. 5,26,560

        (3)   Proportion to be taken to the credit of P L A/c ·

              ⅔ × Rs. 5,26,560 · Rs. 3,51,040.

Problem 9.

    GS Construction Ltd. undertook a contract for Rs. 8,00,000 from 1st January 1988. The particulars in regard to the contract for the year ended 31st December, 1988, were as follows ·

	Rs.
Materials purchased	1,25,000
Wages paid	90,000
Direct expenditure	10,000
General overhead	15,000
Depreciation of plant	12,000
Materials in hand on 31.12.88	29,000
Wages accrued on 31.12.88	10,000
Cash received from contractee (80% of work certified)	2,40,000
Uncertified work	10,000

The contract deed contained an escalation clause as stated below :

    "In the event of prices of materials and rates of wages increase by more than 5% the contract price would be increased accordingly by 25% of the rise in the cost of materials and wages beyond 5% in each case."

    It was found that, from the date of signing the deed the prices of materials and wage rates increased by 20% and 25% respectively. The value of the work certified does not take into accounts the effect of the above clause.

    Prepare the Contract Account showing the profit or loss on the contract to be transferred to Profit & Loss Account.

Solution :

GS Construction Ltd.

Dr.		Contract No.........A/c		*Cr.*

31-12-88		Rs.	31-12-88	Rs.
To Materials		1.25,000	By Materials on hand c/d	29 000
„ Wages	90,000		„ Balance c/d —cost to date	2,33,000
Add : Accrued	10.000			
		1 00.000		
„ Direct expenditure		10,000		
, General overhead		15,000		
„ Depreciation of plant		12,000		
		2,62,000		2,62,000
To Balance b/d		2,33,000	By Work-in-progress c/d	
			—cost of uncertified work	10,000
			„ Balance c/d	
			—cost of certified work	2,23,000
		2,33,000		2,33,000
To Balance b/d		2 23,000	By Work-in-progress c/d	
„ Profit & Loss A/c			—value of certified work	
—proportion of profit			(⅚ × 2.40 000)	3,00,000
transferred[1]		22,400	—Escalation	7,000
„ Work-in-progress c/d				
—provision		61,600		
		3.07.000		3.07.000
1-1-89			1-1-89	
To Materials on hand b/d		29,000	By Accrued Wages b/d	10,000
„ Work-in-progress b/d				
Cost of uncertified				
work	10,000			
Value of certified				
work	3,00,000			
Escalation	7,000			
	3,17,000			
Less : Provision	61,600			
		2,55,400		

Working Notes :

[1]*Escalation of contract price* ·

Materials—	Rs.	Rs.
Increase in cost due to 20% increase in price :		
$\frac{20}{120} \times (1,25,000 - 29,000)$	16,000	
Less : 5% increase beyond which escalation clause		
applies $\frac{5}{20} \times 16,000$	4,000	12,000
Labour—		
Increase in cost due to 25% increase in wage rate :		
$\frac{25}{125} \times 1,00,000$	20.000	
Less : 5% increase beyond which escalation clause		
applies $\frac{5}{25} \times 20,000$	4,000	16,000
Total increase beyond 5%		28,000

Increase in contract price = 25% of Rs. 28,000 = Rs. 7,000

*Proportion of profit to be transferred to P/L A/c .

The work completed is more than 25%, but less than 50% of the total contract. Hence only ⅓ of the profit as reduced by the proportion of cash received to work certified should be transferred to P/L A/c.

    (1) Accounting profit : Rs. (3,07,000 – 2,23,000) = Rs. 84,000

    (2) Profit on realised basis : 80% of Rs. 84,000 = Rs. 67,200

    (3) Transfer to P/L A/c : ⅓ × Rs. 67,200 = Rs. 22,400.

Problem 10.

A building contract was taken in hand on 1st January, 1988 and stood partly completed on 31st December, 1988. The following figures are available in respect of the contract :

	Rs.
Materials sent direct to site less returns	40,000
Materials issued from stores	5,000
Site wages	40,000
Site office expenses	3,000
Inspection fees	2,000
Work under sub-contract	7,000
Central office overhead @ 10% of site wages	. . .
Materials in hand on 31-12-88	4,000
Wages accrued on 31-12-88	2,000

A second-hand plant was purchased on 1st January, 1987 for Rs. 8,500, overhauling charges for which amounted to Rs. 1,500. The plant was used by this contract for 6 months. Depreciation is charged on the plant @ 20% p.a. on diminishing balance.

The contract price was Rs. 2,10,000. Architect's certificate has been received covering two-thirds of the contract price. 10% of the costs till 31st December, 1988 may be taken to have been incurred on work completed but not yet certified. Rs. 1,19,700 has been received from the contractee on account (after deduction of 5% tax at source).

You are required to prepare (a) Contract Account, and (b) Contractee's Account for the year, 1988, taking into consideration, such profit for transfer to Profit & Loss Account as you think proper. Calculate also the amount of retention money.

Solution

Dr.   **Contract No.........Account**   *Cr.*

		Rs.			Rs.
31-12-88			31-12-88		
To Materials		45,000	By Materials on hand c/d		4,000
„ Site wages	40,000		„ Balance c/d—cost to date		1,00,000
Add : Accrued	2,000				
		42,000			
„ Site office expenses		3,000			
„ Inspection fees		2,000			
„ Sub-contract work		7,000			
„ Central office overhead					
(10% of site wages)		4,200			
„ Depreciation on plant[1]		800			
		1,04,000			1,04,000
To Balance b/d		1,00,000	By Work-in-progress c/d		
			—cost of uncertified work 10%		10,000
			„ Balance c/d		
			—cost of certified work 90%		90,000
		1,00,000			1,00,000
To Balance b/d		90,000	By Work-in-progress b/d		
„ Profit & Loss A/c—propor-			—value of certified work		
tion of profit transferred		30,000	($\frac{2}{3}$ × 2.10,000)		1,40,000
„ Work-in-progress c/d					
—provision		20,000			
		1,40,000			1,40,000
1-1-89			1-1-89		
To Materials on hand b/d		4,000	By Accrued wages b/d		2,000
„ Work-in-progress b/d					
cost of uncertified					
work	10,000				
—value of certified					
work	1,40,000				
	1,50,000				
Less : Provision	20,000	1,30,000			

Dr.   **Contractee Account**   *Cr.*

	Rs.		Rs.
To Balance c/d	1,26,000	By Cash	1,19,700
		„ Income Tax A/c	
		—Tax deducted at source[1]	6,300
	1,26,000		1,26,000

The amount of retention money is represented by the amount certified less the payment made including tax paid to Government i.e. ($\frac{2}{3}$ × 2,10,000 — 1,26,000) or, Rs. 14,000.

Working Notes :

[1]Depreciation on Plant :
Written down value on 1-1-88 $\frac{80}{100}$ × (8,500+1,500)=Rs. 8,000

Depreciation thereon for 6 months $\frac{10}{100}$ × $\frac{6}{12}$ × Rs. 8,000=Rs. 800.

[2]Amount of tax deducted at source is ($\frac{5}{95}$ × Rs. 1,19,700) or, Rs. 6,300 and Gross amount realised from the contractee including tax is Rs. (1,19,700 + 6,300) or, Rs. 1,26,000.

[3]Proportion of profit to be transferred to P/L A/c :
Accounting profit : Rs. (1,40,000 − 90,000)=Rs. 50,000

Profit on realised basis : $\frac{1,26,000}{1,40,000}$ × Rs. 50,000=Rs. 45,000

Proportion to be transferred to P/L A/c : $\frac{2}{3}$ × Rs. 45,000=Rs. 30,000.

Problem 11.

A contractor makes up his accounts to 31st December in each year. Contract No. 256 commenced on 1st April, 1988. The costing records yield the following information as at 31st December, 1988 :

	Rs.
Materials charged out to site	2,51,000
Labour charges	5,65,600
Salary to Foremen	81,300

A machine costing Rs. 2,60,000 has been on the site for 146 days. Its working life is estimated at 7 years and its final scrap value is Rs. 15,000.

A supervisor who is paid Rs. 2,000 per month, has devoted approximately one-half of his time to this contract.

All other expenses and administration charges amount to Rs. 1,36,500.

Materials in hand at site on 31st December, 1988, cost Rs. 35,400.

The contract price is Rs. 20 lakh. On 31st December, 1988, two-thirds of the contract was completed. The architect issued certificates covering 50% of the contract price, and the contractor had been paid Rs. 7,50,000 on account.

Prepare a Contract Account and show how much profit or loss should be included, in the financial accounts to 31st December, 1988.

Solution :

Dr.		Contract No.........Account		*Cr.*
31-12-88	Rs.	**31-12-88**		Rs.
To Materials	2,51,000	By Materials at site c/d		35,400
,, Labour	5,65,600	,, Balance c/d—cost to date		10,22,000
,, Foremen's salary	81,300			
,, Supervisor's salary				
(Rs. 2,000 × ½ × 9)	9,000			
,, Depreciation	14,000			
,, Administration charges and other expenses	1,36,500			
	10,57,400			10,57,400
To Balance b/d	10,22,000	By Work-in-progress c/d —cost of uncertified work		2,55,500
		,, Balance c/d —cost of certified work		7,66,500
	10,22,000			10,22,000
To Balance b/d	7,66,500	By Work-in-progress c/d — value of certified work		10,00,000
,, Profit & Loss A/c—proportion of profit transferred	1,16,750			
,, Work-in-progress—provision	1,16,750			
	10,00,000			10,00,000
1-1-89				
To Materials at site b/d	35,400			
,, Work-in-progress b/d				
—cost of uncertified work	2,55,500			
—value of certified work	10,00,000			
	12,55,500			
Less : Provision	1,16,750		11,38,750	

Working Notes :

¹Depreciation on Machinery —

$$\frac{2,60,000 - 15,000}{7} \times \frac{146}{365} = Rs. \ 14,000.$$

²Cost of uncertified work —

Cost of work completed Rs. 10,22,000 represents ⅔ of the contract. Hence cost of full contract = ³⁄₂ × Rs. 10,22,000 = Rs. 15,33,000. Since half of the contract price has been certified by the architect, the cost of certified work is ₁ × Rs. 15,33,000 or, Rs. 7,66,500. Cost of uncertified work is, therefore, Rs. (10,22,000 − 7,66,500) or, Rs. 2,55,500.

³Proportion of profit to be transferred to P/L A/c

(1) Accounting Profit : Rs. (10,00,000 − 7,66,500) = Rs. 2,33,500.

(2) Profit on realised basis : $\frac{7,50,000}{10,00,000} \times$ Rs. 2,33,500 = Rs. 1,75,125.

(3) Proportion of profit to be taken to the credit of P/L A/c :
⅔ × Rs. 1,75,125 = Rs. 1,16,750.

Problem 12.

Mr. Bhaskar started his business as a building contractor on 1st January, 1989. During 1989 he engaged himself on only one contract, of which the contract price was Rs. 5,00,000.

Of the plant and materials charged to the contract, plant which cost Rs. 5,000 and materials which cost Rs. 4,000 were lost in an accident.

On 31st December, 1989 plant which cost Rs. 5,000 was returned to store, the cost of work done but uncertified was Rs. 2,000 and materials costing Rs. 4,000 were in hand on site.

Charge 10% depreciation on plant, carry forward by way of reserve one-third of profit received and compile Contract Account and Balance Sheet from the following Trial Balance as on 31st December, 1989 -

	Rs.	Rs.
Capital Account		1,20,000
Creditors		10,000
Cash received on contract (80% of work certified)		2,00,000
Land and Buildings etc.	43,000	
Bank Balance	25,000	
Charged to contract—		
Materials	90,000	
Plant	25,000	
Wages	1,40,000	
Expenses	7,000	
	3,30,000	3,30,000

Solution :

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Books of Bhaskar

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Dr.   **Contract Account**   Cr.

31.12.89	Rs.	31.12.89	Rs.
To Materials	90,000	By Profit & Loss A/c	
., Plant	25,000	—plant lost in accident	5,000
., Wages	1,40,000	—materials lost in accident	4,000
., Expenses	7,000	,. Plant returned to store	
		—Depreciated value	4,500
		., Plant at site c/d	
		—depreciated value	13,500
		., Materials at site c/d	4,000
		,. Balance c/d	
		—cost to date	2,31,000
	2,62,000		2,62,000
To Balance b/d	2,31,000	By Work-in-progress c/d	
		- cost of uncertified work	2,000
		., Balance c/d	
		- cost of certified work	2,29,000
	2,31,000		2,31,000
To Balance b/d	2,29,000	''y Work-in-progress c/d	
,. Profit & Loss A/c—propor-		value of certified work	2,50,000
tion of profit transferred[a]	11,200		
., Work-in-progress c/d			
—provision	9,800		
	2,50,000		2,50,000
1.1.90			
To Plant at site b/d	13,500		
,. Materials at site b/d	4,000		
., Work-in-progress b d :			
Cost of uncertified			
work	2,000		
Value of certified			
work	2,50,000		
	2,52,000		
Less : Provision	9,800	2,42,200	

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Balance Sheet *as at 31st December, 1989*

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Liabilities	Rs.	Assets		Rs.
Capital Account	1,20,000	Land & Buildings		43,000
Add : Profit on contract	11,200	Plant at store at cost	5,000	
	1,31,200	*Less* : Depreciation	500	
Less : Accidental loss				4,500
of plant and		—at site at cost	15,000	
materials		*Less* : Depreciation	1,500	
(5,000 + 4,000)	9,000			13,500
	1,22,200	Materials at site		4,000
Creditors	10,000	Work-in-progress	2,42,200	
		Less : Cash received		
		on account	2,00,000	
				42,200
		Bank Balance		25,000
	1,32,200			1,32,200

Working Notes :

¹Value of work certified—

$\frac{100}{60}$ × Rs. 2,00,000 = 2,50,000

²Proportion of profit to be transferred to P/L A/c–

(1) Accounting profit : Rs. (2,50,000 – 2,29,000) = Rs. 21,000

(2) Profit on realised basis : 80% of Rs. 21,000 = Rs. 16,800

(3) Proportion to be transferred to P/L A/c = $\frac{2}{3}$ × Rs. 16.800 = Rs. 11,200.

Problem 13.

Joy Engineering Co. undertakes a long-term contract which involves the fabrication of pre-stressed concrete blocks and the erection of the same at consumer's site.

The following information is supplied regarding the contract which is incomplete on 31st March, 1989—

Cost incurred—

	Rs.
Fabrication costs to date :	
Direct Materials	2,80,000
Direct Labour	90,000
Overheads	75,000
	4,45,000
Erection costs to date	15,000
	4,60,000
Contract price	8,19,000
Cash received on account	6,00,000

Technical estimate of work completed to date—

Fabrication—

Direct Material	80%
Direct Labour & Overhead	75%
Erection	25%

What profit should be taken into credit for the period upto 31st March, 1989.

Solution :

Statement showing estimated total profit on completion of contract

	Up-to-date cost		Further costs		Total Rs
	% Completion	Rs.	% Completion	Rs.	
Fabrication costs :					
Direct Materials	80	2,80,000	20	70,000	3,50,000
Direct Labour	75	90,000	25	30,000	1,20,000
Overheads	75	75,000	25	25,000	1,00,000
		4,45,000		1,25,000	5,70,000
Erection costs	25	15,000	75	45,000	60,000
Total		4,60,000		1,70,000	6,30,000
Estimated profit					1,89,000
Contract price					8,19,000

Profit to be taken to the credit of P L A/c :

$$\frac{\text{Up-to-date cost}}{\text{Estimated total cost}} \times \text{Estimated total profit}$$

$$\frac{4,60,000}{6,30,000} \times 1,89,000 = \text{Rs. } 1,38,000$$

Alternative method :

$$\frac{\text{Cash received}}{\text{Contract price}} \times \text{Estimated total profit}$$

$$\frac{6,00,000}{8,19,000} \times 1,89,000 = \text{Rs. } 1,38,462$$

Problem 14.

The following particulars are obtained from the books of D. K. Construction Ltd. as on 31st March, 1989 :

Plant and Equipment at cost	Rs. 9,80,000
Vehicles at cost	Rs. 4,00,000

Details of contracts which remain incomplete as on 31-3-1989 :

Contract No.	15 (Rs. lac)	19 (Rs. lac)	21 (Rs. lac)
Estimated final sales value	16·00	11·20	32·00
Estimated final cost	12·80	14·00	24·00
Wages	4·80	4·00	2·40
Materials	2·00	2·20	0·88
Overheads (excluding depreciation)	2·88	2·92	1·16
Total costs to-date	9·68	9·12	4·44
Value certified by architects	14·40	8·40	4·80
Progress payments received	10·00	6·40	4·00

Depreciation of plant and equipment and vehicle should be charged at 20% to the three contracts in proportion to work certified.

You are required to prepare statements to show contractwise and in total :

    (i) Profit/loss to be taken to the Profit & Loss A/c for the year ended 31st March, 1989 ; and

    (ii) Work-in-progress as would appear in the Balance Sheet as at 31st March, 1989.   *(C. A. Inter.—Adapted)*

Solution :

Statement of Profit/Loss to be taken to Profit & Loss A/c
for the year ended 31-3-89

Contract Numbers	15	19	21	Total Rs. (lac)
% of completion : Work certified $\dfrac{\text{Work certified}}{\text{Estimated sales value}} \times 100$	$\dfrac{14\cdot40}{16} \times 100$ 90%	$\dfrac{8\cdot40}{11\cdot20} \times 100$ 75%	$\dfrac{4\cdot80}{32} \times 100$ 15%	
	Rs. (lac)	Rs. (lac)	Rs. (lac)	
Estimated profit/loss on completion :				
Estimated sales value	16.00	11·20	32·00	
Estimated cost	12·80	14·00	24·00	
Estimated profit (loss)	3·20	(2·80)	8·00	
Profit/loss for the year :				
Costs to date (excluding depreciation)	9·68	9·12	4·44	23·24
Depreciation[1]	1·44	0·84	0·48	2·76
Total cost to date	11·12	9·96	4·92	26·00
Work certified	14·40	8·40	4·80	27·60
Accounting profit (loss)	3·28	(1·56)	(0·12)	1·60
Profit (loss) to be taken to P/L A/c[2]	2·00	(2·80)	(0·12)	(0·92)
Provision	1·28	1·24	—	2·52

Working Notes :

[1]Depreciation –

20% of Rs. 13,80,000 or Rs. 2,76,000 apportioned in the ratio of work certified as shown below :

$$\text{Contract No. } 15 = \frac{14\cdot40}{27\cdot60} \times 2\cdot76 = \text{Rs. } 1\cdot44 \text{ lac}$$

$$,, \qquad 19 = \frac{8\cdot40}{27\cdot60} \times 2\cdot76 = \text{Rs. } 0\cdot84 \text{ lac}$$

$$,, \qquad 21 = \frac{4\cdot80}{27\cdot60} \times 2\cdot76 = \text{Rs. } 0\cdot48 \text{ lac}$$

[2]Profit/loss to P/L A/c

Since Contract No. 15 is almost on completion, profit to be taken to P/L A/c has been computed thus :

$$\frac{\text{Cash received}}{\text{Contract price}} \times \text{Estimated total profit}$$

$$\frac{10\cdot00}{16\cdot00} \times 3\cdot20 = \text{Rs. } 2 \text{ lac}$$

In respect of Contract No. 19, the total loss is Rs. 2·80 lac (loss of current year Rs. 1·56 lac; further loss which will arise on completion of the contract Rs. 1·24 lac).

Statement of work-in-progress as would appear in the
Balance Sheet *as at 31-3-89*

Contract Numbers	15 Rs. (lac)	19 Rs. (lac)	21 Rs. (lac)	Total Rs. (lac)
Work certified	14·40	8·40	4·80	27·60
Less : Provision	1·28	1·24	—	2·52
Work-in-progress	13·12	7·16	4·80	25·08
Less : Progress payments received	10·00	6·40	4·00	20·40
	3·12	0·76	0·80	4·68

Alternative calculation of work-in-progress —

Statement of work-in-progress as would appear in the Balance Sheet as at 31-3-89

Contract Numbers	15 Rs. (lac)	19 Rs. (lac)	21 Rs. (lac)	Total Rs. (lac)
Total cost to date	11·12	9·96	4·92	26·00
Add : Profit transferred to P/L A/c	2·00	—	—	2·00
Less : Foreseeable loss transferred to P/L A/c	--	(2·80)	(0·12)	(2·92)
Work-in-progress	13·12	7·16	4·80	25·08
Less : Payments received	10·00	6·40	4·00	20·40
	3·12	0·76	0·80	4·68

Problem 15.

BD Construction Ltd. is a firm of building contractors. The following information is provided relating to their uncompleted contracts as at 31st December, 1986 :

Contract	A	B	C	D
Date of commencement	1.1.86	1.2.86	1.8.86	1.10.86
Expected date of completion	30.4.87	31.3.87	31.1.87	31.3.87
	Rs.	Rs.	Rs.	Rs.
Cost of work to 31st December, 1986	1,59,000	57,000	15,000	4,000
Estimated further cost to completion	36,000	15,000	2,000	62,000
Value of work certified to 31st December, 1986	2,00,000	50,000	18,000	
Contract price	2,60,000	65,000	21,000	75,000
Progress payment received and receivable at 31st December, 1986	1,75,000	40,000		

You are required to prepare :

(a) a statement showing your calculations of the separate values to be placed on each contract at 31st December, 1986. The statement should show the profit or loss, if any, included in each of the valuations. You should include in the statements appropriate narratives to explain the treatments chosen.

(b) a statement of the information in respect of the four contracts which would appear in the Balance Sheet of BD Construction Ltd. at 31st December, 1986.

Solution :

Contract A	Rs.	Rs.
Costs to 31.12.86		1,59,000
Estimated profits :		
Contract price	2,60,000	
Estimated total costs (1,59,000 + 36,000)	1,95,000	
Estimated total profit on completion	65,000	
Proportion to be transferred to P/L A/c		
$\frac{1,75,000}{2,60,000} \times Rs.65,000$		43,750
Value of work.in progress		2,02,750

As the contract is about to be completed, it is reasonable to take credit for that proportion of the estimated total profit which the work certified (*less* retentions) bears to the total contract price.

Contract B   Rs.

	Rs.	
Costs to 31.12.86		57,000
Estimated profit/loss :		
Contract price	65,000	
Estimated total costs (57,000+15,000)	72,000	
Estimated loss on completion	7,000	(7,000)
Value of work-in-progress		50,000

The full amount of foreseeable loss should be provided for as soon as it becomes clear that a loss will arise.

Contract C

Value of work-in-progress represents costs to 31.12.86   Rs.   15,000

This contract has been valued at cost and no profit has been taken into consideration because it is a short-term contract (i.e., of less than twelve months' duration).

Contract D

Value of work-in-progress represents costs to 31.12.86   Rs.   4,000

As the contract is in its early stage, it is difficult to foresee whether any over-all profit or loss will be made, though it may be anticipated that the contract will be profitable. It is, therefore, valued at cost.

Balance Sheet of BD Construction Ltd. as at 3-12-86 (*includes*)

Work-in-progress	Rs.
Long-term contracts (*A, B* and *D*) at cost	2,56,750
Plus attributable profits less foreseeable loss	
Less : Progress payments received and receivable	2,15,000
	41,750
Short-term contract (*C*) at cost	15,000
	56,750

Problem 16.

Bricon Ltd., building contractors, commenced to trade on 31st January, 1987. At 31st December, 1987 there were three contracts uncompleted, numbers being 17, 19 and 20, and the following details are available in respect of them :

Contract No.	17	19	20
	Rs.	Rs.	Rs.
Wages	24,000	20,000	12,000
Add : 50% overheads	12,000	10,000	6,000
Materials	11,000	13,000	5,000
Plant hire	1,000	1,200	—
Expenses	4,000	2,000	600
Vehicle expenses	1,400	1,600	400
Plant expenses	2,000	1,800	800
Cost to date	55,400	49,600	24,800

Value of work to date which agreed with

client's architect	70,000	40,000	26,000
Less : Retentions	7,000	4,000	2,600
	63,000	36,000	23,400
Progress payments invoiced at 31st Dec. 1987	60,000	32,000	20,000
Progress payments received at 31st Dec. 1987	50,000	32,000	20,000
Estimate of :			
final cost	60,000	70,000	1,20,000
final sale value	76,000	56,000	1,60,000

All materials are purchased for specific contracts and any unused material on site are included in the measure.

You are required to compute the value that should be included in work-in-progress at 31st December, 1987, using methods that you consider appropriate to the circumstances of each contract. Each calculation should be preceded by a brief justification of the method you decide to apply to it.

Solution :

Contract No. 17. This contract is near completion $\left(\frac{70,000}{76,000} \times 100\right.$ or 92% complete). It should, therefore, be reasonable to take credit for that proportion of the estimated total profit which the work certified (*less* retentions) bears to the total contract price). The work-in-progress valuation of the contract on this basis would be :

	Rs.
Cost to date	55,400
Add : Profit $\frac{63,000}{76,000} \times (76,000 - 60,000)$	13,263
	68,663

Contract No. 19. This contract is estimated to result in a loss of Rs. 14,000 (i.e., Rs. 70,000 − Rs. 56,000) on completion. The loss should be provided for in full as soon as it becomes clear that the contract will result in a loss. The work-in-progress valuation of the contract would, therefore, be :

	Rs.
Cost to date	49,600
Less : Provision for loss	14,000
	35.600

Contract No. 20. This contract is in its early stage. Therefore, its outcome cannot be ascertained with reasonable certainty. As it is anticipated that the contract will be profitable, the work-in-progress should be valued at cost. Accordingly, the valuation would be :

Cost to date	Rs. 24,800

Problem 17.

From the following particulars of Contract No. 35, prepare Contract Account as on 31-12-1989 :

Materials issued to site—Rs. 2,10,000

Labour engaged on site—Rs. 90,000

Overhead charges allocated—Rs. 30,000

Plant issued to site—Rs. 84,000

Uncertified work—Rs. 48,000

Contract price—Rs. 6,00,000

Cash received on account—Rs. 3,60,000 representing 80% of work certified.

Materials sold—Rs. 3,000 (cost Rs. 2,000)

Materials at site on 31-12-89—Rs. 9,000

Plant at site on 31-12-89—Rs. 60,000

Estimated further expenses to complete the contract—

Materials—Rs. 60,000, Labour—Rs. 30,000, Overhead—Rs. 24,000.

Estimated value of scrap on completion—Rs. 6,000.

Provision for contingencies to be made at 2% of the total cost of the contract before such provision.

Solution

Dr. **Contract No. 35 Account** *Cr.*

31-12-89		Rs.	31-12-89		Rs.
To Materials		2,10,000	By Cash—materials sold		3,000
,, Labour		90,000	,, Materials at site c/d		9,000
,, Overheads		30,000	,, Plant at site c/d		60,000
,, Plant		84,000	,, Balance c/d—cost to date		3,43,000
,, Profit & Loss A/c profit on materials sold		1,000			
		4,15,000			4,15,000
To Balance b/d – cost to date		3,43,000	By Work-in-progress c/d—cost of work not certified		48,000
			,, Balance c/d— cost of work certified		2,95,000
		3,43,000			3,43,000
To Balance b/d – cost of work certified		2,95,000	By Work-in-progress c/d—value of work certified		4,50,000
,, Profit & Loss A/c—proportion of profit transferred		78,480			
,, Work-in-progress c/d —provision		76,520			
		4,50,000			4,50,000
1-1-90					
To Materials at site b/d		9,000			
,, Plant at site b/d		60,000			
,, Work-in-progress b/d					
Cost of work not certified	48,000				
Vaule of work certified	4,50,000				
	4,98,000				
Less : Provision	76,520	4,21,480			

Working Notes :

¹Value of work certified : $\frac{120}{96} \times$ Rs. 3,60,000 = Rs. 4,50,000.

²Proportion of profit to be taken to the credit of Profit & Loss A/c

			Rs.
Up-to-date cost			3,43,000
Add : Estimated further cost of Materials :			
Opening Balance	9,000		
Purchases	60,000		
	69,000		
Less : Value of scrap	6,000	63,000	
Labour		30,000	
Overhead		24,000	1,17,000
			4,60,000
Add Provision for contingencies @ 2% on Rs. 4,60,000			9,200
Estimated Total Cost			4,69,200
Contract Price			6,00,000
Estimated Total Profit			1,30,800

Profit to be taken to P/L A/c :

$$\frac{\text{Cash received}}{\text{Contract price}} \times \text{Estimated total profit}$$

$$\frac{3,60,000}{6,00,000} \times \text{Rs. } 1,30,800 = \text{Rs. } 78,480.$$

Problem 18.

G. K. Basak carrying on business as contractor undertook a contract for Rs. 1,50,000 from 1st January, 1989 and his expenditure during the calendar year was :

	Rs.
Plant purchased on the date of commencement	15,000
Machinery	10,000
Materials purchased	45,600
Wages	22,000
Direct Expenses	4,800
Charges for administration expenses	8,000

Part of machinery costing Rs. 4,000 being unsuitable for the work was disposed of for Rs. 5,000.

On 31st December, 1989 there were wages accrued Rs. 2,000 and the values of machinery and materials in hand were Rs. 3,000 and Rs. 9,000 respectively. The plant had an effective life of three years.

G. K. Basak received the progress payment of Rs. 88,650 being 90% of the certified value of the work completed upto 31st December, 1989.

To arrive at the figure of profit made on the contract for the first year, the contractor estimated the additional expenditure that would be required to complete the construction and took to the credit of revenue for the year that portion of net estimated profit to be realised on the contract which the certified value of the work done bore to the contract price.

His estimates were—

(i) the contract would take, in all, 18 months to complete ;

(ii) that additional machinery and materials to the value of Rs. 1,000 and Rs. 10,000 would be required ·to be purchased in the

subsequent period and direct expenses and wages would be Rs. 2,000 and Rs. 12,000 respectively ;

(*iii*) charges for administration would continue to be the same every month :

(*iv*) provision for contingencies in the subsequent period to be made at 2% of the total cost of the contract. (*C. A. Final—Adapted*)

Solution :

Dr.   **Contract No......A/c**   *Cr.*

31-12-89	Rs.	31-12-89	Rs.
To Materials	45,600	By Cash—machinery sold	5,000
Wages	22,000	,, Plant at site (²/₃rds) c/d	10,000
Direct Expenses	4,800	,, Machinery at site c/d	3,000
Administration Expenses	8,000	,, Materials at site c/d	9,000
Plant	15,000	,, Balance c/d—cost to date	
Machinery	10 000	and cost of work certified	81,400
Profit & Loss A/c—profit			
on machinery sold	1,000		
Outstanding wages c/d	2,000		
	1 08 400		1,08,400
To Balance b/d—cost of work		By Work-in-progress c/d	
certified	81 400	—value of work certified	98 500
,, Profit & Loss A/c—proportion			
of profit transferred	13,327		
,, Work-in-progress c/d			
—provision	3,773		
	98,500		98 500
1-1-90		1-1-90	
To Machinery at the site b/d	3,000	By Outstanding Wages b/d	2 000
,, Plant at site b/d	10,000		
,, Materials at site b/d	9,000		
,, Work-in-progress b/d			
Value of work certified 98,500			
Less : Provision 3,773	94,727		

Working Notes :

   ¹Work certified : ⁹⁸/₈₈ × Rs. 88,650 = Rs. 98,500

   ²Proportion of profit to be transferred to P/L A/c :

			Rs.
Cost to date			81,400
Add . Estimated further cost :			
Materials—Opening balance	9,000		
Purchases	10,000	19,000	
Wages		12 000	
Direct Expenses		2,000	
Administration Expenses*		4,000	
Plant—Opening balance	10,000		
Less : Residual value**	7,500	2,500	
Machinery—Opening balance	3,000		
Purchases	1,000	4,000	43,500
			1,24,900
Add : Provision for contingencies 2% × Rs. 1,24,900			2,549
Estimated total cost			1,27,449
Total contract price			1,50,000
Estimated total Profit			22,551

Estimated profit to be transferred to P/L A/c :

$$\frac{88.650}{1.50,000} \times Rs. \ 22,551 = Rs. \ 13,327.$$

*The contract will take 6 months more to complete. Administration expenses for one year amount to Rs. 8,000. Hence expenses for 6 months will be ½ of Rs. 8,000 or Rs. 4,000 (charges per month remaining the same).

**The plant (cost Rs. 15,000) has an effective life of 3 years. Hence after 1½ years (18 months) its residual value will be Rs. (½ × 15,000) or Rs. 7,500. So, depreciation chargeable for the 6 months of 1990 shall be (Rs. 10,000−7.500) or Rs. 2,500.

Problem 19.

The following are particulars of two contracts *A* and *B*, undertaken by RB Construction Ltd. :

			B
Date commenced	1st June, 1986		1st July, 1987
Date completed	30th Nov., 1987		30th April, 1988
Contract price	Rs. 2,00,000		Rs. 3,20,000
Direct expenditure :	In 1986	In 1987	In 1987
	Rs.	Rs.	Rs.
Materials	29,264	51,782	66,540
Wages	32,474	62,496	81,730
Direct expenses	1,732	2,430	3,248
Plant purchased for cash, at commencement of contract	21,450	...	24,700
Payments for plant acquired on hire-purchase terms		10,400	5,200
Penalty for failure to complete contract *A* by 31st October 1987	—	1,000	—
Cash received	72,000	1,27,000	1,44,000

The plant purchased in 1986 for cash was sold on 30th November, 1987 for Rs. 5,500.

As regards the plant acquired on hire-purchase terms, an initial deposit of Rs. 5,200 was paid on 28th February, 1987. The hire-purchase agreement called for two further payments of Rs. 5,200 each, which included interest at the rate of 12 per cent per annum : these payments were made on the due dates, viz. 30th June, 1987 and 31st October, 1987. This plant, the cash price of which was Rs. 15,008, was used on contract *A* until 30th June, 1987, when it was transferred to contract *B*. For depreciation purposes the value of this plant at the date of transfer was taken to be Rs. 12,000.

The cash received in each year represented the contract price of all work certified in that year, less, in the case of uncompleted contracts, 10 per cent retention money, and in the case of cash received for contract *A* in 1987, the penalty.

When the annual accounts for 1986 were prepared, it was expected that, contract *A* would be completed on 31st October, 1987, on which date

the market value of the plant purchased for cash would be Rs. 7,850. At that time it was estimated that expenditure on contract *A* in 1987 would amount to Rs. 78,000, but the acquisition of additional plant in 1987 was not then foreseen.

When the annual accounts for 1987 were prepared, it was expected that, contract *B* would be completed on 30th April, 1988, on which date the market values of the plant purchased for cash and of the plant transferred from contract *A* would be Rs. 18,000 and Rs. 8,500 respectively. At that time it was estimated that, the further expenditure on contract *B* would amount to Rs. 92,082.

The following principles were adopted for the purposes of the annual accounts :

(*a*) All depreciation was charged to contracts by the straight-line method, and was calculated by reference to the expected market value of the relevant plant at the completion of each contract.

(*b*) Credit was taken for that portion of the estimated profit on each uncompleted contract which the *contract price of the work certified* bore to the total contract price.

You are required to prepare summaries of the accounts for :

(*a*) Contract *A* for the years, 1986 and 1987, and

(*b*) Contract *B* for the year, 1987.

Showing in each case the transfer to profit and loss account at the end of the year.

*Assumed that interest on Hire-Purchase has been taken as an element of cost.

Solution :

Dr.   Contract *A* Account   *Cr.*

1986		Rs.	1986		Rs.
Dec. 31	To Materials	29,264	Dec. 31	By Plant at site c/d[1]	15,850
	,, Wages	32,474			
	,, Direct expenses	1,732			
	,, Plant	21,450			
		84,920			
	To Profit & Loss A/c— proportion of profit transferred[2]	17,972	,,	By Work-in-progress c/d[3]	87,042
		1,02,892			1,02,892
1987			1987		
Jan. 1	To Plant at site b/d	15,850	June 30	By Plant transferred to Contract *B*	12,000
	,, Work-in-progress b/d	87,042			
Nov. 30	,, Materials	51,782	Nov. 30	,, Cash – sale of plant	5,500
	,, Wages	62,496		,, Contractee A/c —contract price	2,00,000
	,, Direct expenses	2,430			
	,, Plant	15,008	Dec. 31	,, Profit & Loss A/c —loss	18,500
	,, Hire-purchase interest[4]	392			
	,, Penalty	1,000			
		2,36,000			2,36,000

Working Notes :

¹*Value of plant. carried down at 31-12-86 :*	Rs.
Cost at 1-6-86	21,450
Estimated market value at 31-10-87	7,850
Depreciation over 17 months	13,600
Cost at 1-6-86	21,450
Less : Depreciation for 7 months (June to Dec.) :
$\frac{7}{17} \times$ Rs. 13,600	5.600
	15,850

²*Proportion of profit to be transferred to P|L A|c :*

| Rs.
--- | ---
Total expenditure to date | 84,920
Less : Estimated residual value of plant | 7,850
 | 77,070
Add : Estimated further expenditure | 78 000
Estimated total cost | 1,55,070
Total contract price | 2,00,000
Estimated total profit | 44,930
Work certified : $\frac{100}{90} \times$ Rs. 72,000 | 80,000

Profit to be transferred to P|L A|c :

$$\frac{\text{Work certified}}{\text{Contract price}} \times \text{Estimated total profit}$$

$\frac{80,000}{2,00,000} \times$ Rs. 44,930	17,972

³*Work-in-progress. carried down at 31-12-86 :*

|
--- | ---
Total expenditure to date | 84,920
Less : Value of plant carried down on 31-12-86 | 15,850
Net expenditure to date | 69,070
Add : Profit taken to P|L A|c | 17,972
 | 87,042

⁴*Hire-purchase interest :*

| |
--- | --- | ---
Cash price | 15,008 |
Less : Down payment | 5,200 |
 | 9,808 |
Add : Interest for 4 months | 392 | to be charged to contract *A*
 | 10,200 |
Less : Instalment | 5,200 |
 | 5,000 |
Add : Interest for 4 months | 200 | to be charged to contract *B*
 | 5,200 |
Less : Instalment | 5,200 |

Dr.   **Contract B Account**   **Cr.**

1987		Rs.	1987		Rs.
July 1	To Plant transferred from contract *A*	12,000	Dec. 31	By Plant at site c/d '	30,580
Dec. 31	„ Materials	66,540		„ Work-in-progress c/d '	1,90,838
	„ Wages	81,730			
	„ Direct expenses	3,248			
	., Plant	24,700			
	„ Hire-purchase interest	200			
		1,88,418			
	„ Profit & Loss A/c —proportion of profit transferred ²	33,000			
		2,21,418			2,21,418
1988					
Jan. 1	To Plant at site b/d	30,580			
	„ Work-in-progress b/d	1,90,838			

Working Notes :

	Rs.
'Value of plant, carried down at 31-12-87	
Transfer at market value from contract 1	12,000
Cost at 1-7-87	24,700
	36,700
Estimated market value at 30-6-88 (18,000+8,500)	26,500
Depreciation over 10 months	10,200
Cost to contract (plant)	36,700
Less : Depreciation for 6 months (July to Dec.)	
$\frac{6}{10} \times$ Rs. 10,200	6,120
Plant at site	30,580

²*Proportion of profit transferred to P/L A/c ·*

Total expenditure to date	1,88,418
Less : Estimated residual value of plant	26,500
	1,61,918
Add : Estimated further expenditure	92,082
Estimated total cost	2,54,000
Contract price	3,20,000
Estimated total profit	66,000
Work certified $\frac{90}{100} \times$ Rs. 1,44,000	1,60,000
Profit to be transferred to P/L A/c : $\frac{1,60,000}{3,20,000}$ ⋅ Rs. 66,000	33,000

³Work-in-progress, carried down at 31-12-87 :

Total expenditure to date	1,88,418
Less : Value of plant carried down on 31-21-87	30,580
Net expenditure to date	1,57,838
Add : Profit taken to P.L A/c	33,000
	1,90,838

(It may be noticed that the value of work-in-progress in respect of both the contracts is more than the value of work certified.)

BATCH COSTING

It is another variant of Job Costing. This is used in industries manufacturing radio or television sets, aircrafts, confectioneries, toys, patent medicine, garments etc. Let 5,000 radio sets are to be manufactured. In Job costing, the production of 5,000 radio sets is taken as a job and cost records are maintained in respect of the entire job. If production of 500 sets is considered economic, 500 sets shall be taken as a batch and as such there shall be 10 batches of production. For each batch separate cost records have to be maintained.

What will be the number of units in a batch is an important factor to decide. That number of units shall constitute a batch which gives the greatest economy. Economic Batch Quantity *(EBQ)* is worked out in the same line as economic order quantity. Let us see how *EBQ* is worked out.

Production cost consists of *two elements*—

(1) Set-up or preparation cost, and (2) Carrying cost.

As the quantity in each batch increases, the set-up cost per unit decreases and the carrying cost increases. The opposite shall result, if the quantity in each batch decreases. The number of units which will be produced at the minimum total cost represents *Economic Batch Quantity (EBQ)*. Economic Batch Quantity is also known as *Optimum Batch Quantity (OBQ)*.

Set-up cost means cost of setting up of machines and tools for production. This is of *fixed nature*. It does not change due to change in the quantity in the batch. It, however, varies directly with the number of batches. Set-up cost of four batches shall be four times the set-up cost of one batch, even though the number of units in each batch may vary. Set-up cost should be computed after taking into consideration the time lost due to change-over from one batch to another, loss of speed due to change-over, materials wastage due to change-over etc.

Carrying cost includes several variable factors like—cost of manufacture, storage, interest on capital invested, depreciation etc.

Economic Batch Quantity *(EBQ)* is worked out by applying the following formula :

$$EBQ = \sqrt{\frac{2.U.S.}{C_o}}$$

Where U = Total number of units to be produced in a year.

S = Set-up cost per batch.

C_o = Carrying cost *per unit* of production for one year.

If the rate of interest and the cost of production per unit is given, the formula may be amended as under :

$$EBQ = \sqrt{\frac{2.U.S.}{I \times C}}$$

Where I = Interest per rupee per year

C_m = Cost of manufacture per unit

WORKED-OUT PROBLEMS

Problem 1.

In a manufacturing concern 1,00,000 units of a product are produced in a year. The cost of setting up of machine and tools each time for production amounts to Rs. 500. The cost of manufacture, storage, depreciation etc. amount to Rs. 40 per unit and the rate of interest is 10% p.a. Find out the Economic Batch Quantity.

Solution :

$$EBQ = \sqrt{\frac{2 \times U \times S}{I \times C_m}}$$

Where $U = 1,00,000$

$S = $ Rs. 500

$I \times C_m = \cdot 1 \times 40$

$$\sqrt{\frac{2 \times 1,00,000 \times 500}{0 \cdot 1 \times 40}}$$

$= 5,000$ units.

The entire output of 1,00,000 units for the year shall, therefore, come from 20 batches of 5,000 units each.

Problem 2.

A contractor has to supply 10,000 paper cones per day to a textile unit. He finds that, when he starts a production run, he can produce 25,000 paper cones per day. The cost of holding a paper cone in stock for one year is 2 paise and the set-up cost of a production run is Rs. 18. How frequently should production run be made. Assume 300 working days in a year.

Solution :

Annual sales = 10,000 × 300 or 30,00,000 paper cones

Set-up cost = Rs. 18

Carrying cost = Re. 0·02 per unit per annum

$$EBQ = \sqrt{\frac{2 \cdot U.S.}{C_o}} = \sqrt{\frac{2 \times 30,00,000 \times 18}{0 \cdot 02}} = 73,485 \text{ units (nearly)}$$

No. of set-up per annum $= \dfrac{\text{Annual production}}{EBQ}$

$$= \frac{30,00,000}{73,485} = 40 \cdot 82 \text{ i.e., } 41$$

Interval between two consecutive production runs

$$= \frac{300}{41} = 7 \cdot 31 \text{ i.e., } 7 \text{ working days}$$

Problem 3.

BK Bearings Ltd. is committed to supply 24,000 bearings per annum to Century Fans Ltd. on a steady daily basis. It is estimated that it costs 10 paise as inventory holding cost per bearing per month and that the set-up cost per run of bearing manufacture is Rs. 324.

(i) What should be the optimum run size for bearing manufacture ?

(ii) What should be the interval between two consecutive optimum runs ?

(iii) Find out the minimum inventory holding cost.

Solution :

(i) *Optimum run size*

$$= \sqrt{\frac{2.U.S}{C_0}}$$

$$= \sqrt{\frac{2 \times 24,000 \times 324}{1 \cdot 20}}$$ where U = units to be produced in a year

S = set-up cost

C_0 = carrying cost per unit for one

$= 3,600$ units   year $(12 \times 0 \cdot 10 = $ Rs. $1 \cdot 20)$

(ii) *Interval between two consecutive optimum runs :*

$$= \frac{365^1}{\text{No. of set-up per annum}} = \frac{365}{2/3^2} = 54 \cdot 75 \text{ or } 55 \text{ calendar days}$$

Notes : [1]A year has been taken of 365 days. A different result will come, if calculations are made on the basis of actual number of working days in a year.

[2]No. of set-up per annum = $\frac{\text{Annual production}}{\text{Economic run size}} = \frac{24\,000}{3,600} = \frac{20}{3}$.

(iii) *Minimum inventory holding cost per annum :*

Average inventory $\frac{3,600}{2}$ or 1,800 bearings @ Rs. $1 \cdot 20$

$$= \text{Rs. } 2,160.$$

Problem 4.

Following information relates to the manufacturing of a component *X*—101 in a cost centre :

Cost of material :   6 paise per component

Operator's wages :   72 paise an hour

Machine hour rate :   Rs. $1 \cdot 50$

Setting-up time of the machine :   2 hours and 20 minutes

Manufacturing time :   10 minutes per component

Prepare a cost sheet showing both production and set-up costs in total and per unit when a batch consists of (i) 10 components, (ii) 100 components and (iii) 1,000 components.

Solution :

Cost Sheet for a Batch of 10 Components

	Cost of Batch	Cost per unit
	Rs.	Rs.
Setting-up Cost :		
Wages of operator : 2 hrs. 20 mts. @ 72 p. per hr.	1·68	
Overhead : 2 hrs. 20 mts. @ Rs. 1·50 per hr.	3·50	
	5·18	0·518
Production Cost :		
Material : 10 @ 6 p.	0·60	0·060
Wages of operator : 10 × 10 mts. @ 72 p. per hr.	1·20	0·120
Overhead : 10 × 10 mts. @ Rs. 1·50 per hr.	2·50	0·250
	9·48	0·948

Cost Sheet for a Batch of 100 Components

	Cost of Batch	Cost per unit
	Rs.	Rs.
Setting-up Cost :		
Wages of operator : 2 hrs. 20 mts. @ 72 p. per hr.	1·68	
Overhead : 2 hrs. 20 mts. @ Rs. 1·50 per hr.	3·50	
	5·18	0·0518
Production Cost :		
Material : 100 @ 6 p.	6·00	0·0600
Wages of operator : 100 × 10 mts. @ 72 p. per hr.	12·00	0·1200
Overhead : 100 × 10 mts. @ Rs. 1·50 per hr.	25·00	0·2500
	48·18	0·4818

Cost Sheet for a Batch of 1,000 Components

	Cost of Batch	Cost per unit
	Rs.	Rs.
Setting-up Cost :		
Wages of operator : 2 hrs. 20 mts. @ 72 p. per hr.	1·68	
Overhead : 2 hrs. 20 mts. @ Rs. 1·50 per hr.	3·50	
	5·18	0·0052
Production Cost :		
Material : 1,000 @ 6 p.	60·00	0·0600
Wages of operator : 1,000 × 10 mts. @ 72 p. per hr.	120·00	0·1200
Overhead : 1,000 × 10 mts. @ Rs. 1·50 per hr.	250·00	0·2500
	435·18	0·4352

EXERCISES

Theoretical :

1. What are the main features of a job order costing ? Give a pro-forma cost sheet under such a system. Suggest two types of business where job costing would be appropriate.

2. What do you understand by job costing ? Discuss the circumstances under which job costing should be applied.

3. Distinguish between job costing and contract costing.

4. (a) Describe the special features of contract costing. (b) Give five examples of jobs where contract costing would be appropriate. (*C. U., B. Com. Hons.*)

5. Describe the methods used for treatment in contract accounts, of plant used on contract job, explaining the particular circumstances in which they can be applied.

6. Discuss the necessity of transferring a portion of profit on uncompleted contracts to Profit & Loss Account. How would you ascertain the amount of profit to be transferred to Profit and Loss Account ?

7. Discuss how the profit on uncompleted contracts should be determined.

(*C. U., B. Com. Hons.*)

8. State briefly how profit on uncompleted contract is to be treated in contract accounts ? (*C. U., B Com. Hons.*)

9. What are the different methods of calculating profit on an uncompleted contract ? Give illustrations.

10. What is meant by work-in-progress in contract account ? State the basis of valuation of work-in-progress for the purpose of balance sheet. (*C. U., B. Com. Hons.*)

11. Write short notes on :

(a) Cost plus contract ; (b) Escalation and De-escalation clause ; (c) Retention money ; (d) Uncertified work ; (e) Certified work.

12. Explain the nature and use of batch costing. Describe the concept of economical batch with the help of any simple formula

13. (i) Compare and contrast batch costing and job costing.

(ii) Suggest two types of business where batch costing would be appropriate.

Practical

Re : Job Costing

1. A manufacturing company has received an enquiry for the supply of 10,000 steel folding chairs. The costs are estimated as under :

Raw materials—1,00,000 kg. @ Re. 1 per kg.

Direct wages—10,000 hours @ Rs. 4 per hour.

Variable Overheads :

Factory—Rs. 2·40 per labour hour.

Selling and distribution—Rs. 16,000.

Fixed Overheads :

Factory—Rs. 6,000

Selling and distribution—Rs. 14,000.

Prepare a statement showing the price to be fixed so as to produce a profit of 20 per cent on selling price.

2. Orient Printers Ltd. are asked to quote for supplying 5,000 or 25,000 or 50,000 booklets. They normally expect a profit of 20% on sales.

Costs are estimated as below :	Rs.
Paper and other materials, per 1,000 copies	60
Wages per 1,000 copies	40
Layout cost	1,000
Variable overhead, 120% of wages	—
Fixed Overhead	400

Draft a cost computation, showing also selling prices (to the nearest rupee) that may be quoted per 1,000 copies in each of the three proposals.

3. Prepare a cost sheet for production of 1,000 units of product *A* from the following details :

	Rs.
Material consumption	50,000
Direct wages (at 50 p. per hour) :	
Deptt. *X*	25,000
Deptt. *Y*	15,000
Deptt. *Z*	10,000

Factory overheads :

Deptt. *X* : Machine Hour Rate Rs. 4 for 4,000 machine hours.

Deptt. *Y* : 25 p. per labour hour.

Deptt. *Z* : 60 per cent of wages.

Administration and selling overheads are charged at 20 per cent of works cost.

[*Hints* : Departmental Wages÷50 p—Labour hours]

4. The cost records of I. C. Industries Ltd. give the following information relating to Job No. 132 :

	Rs.
Materials sent to job	1.830
Materials returned from job	215

The job passed through three production departments—*A*, *B* and *C*.

Direct wages Deptt. *A* 20 hours @ Rs. 3 per hour.

Deptt. *B* 15 hours @ Rs. 2 per hour.

Deptt. *C* 5 hours @ Rs. 4 per hour.

Variable overheads of the above departments are estimated as—

Deptt. *A* Rs. 15,000 for 7,500 labour hours.

Deptt. *B* Rs. 8,000 for 2,000 labour hours.

Deptt. *C* Rs. 12,000 for 4,000 labour hours.

The fixed overhead of the factory is Rs. 45,000 for 18,000 normal working hours.

Prepare a Job Cost Sheet for Job No. 132 providing for a profit of 20% on sales.

5. According to the factory job cost ledger, Job No. 5326 has incurred the following prime costs :

Materials (Direct) : 50 kg. at Rs. 14 per kg.

Wages (Direct) Department *X*—18 hours at Rs. 7 per hour

Department *Y*—32 hours at Rs. 6 per hour

Budgeted overhead for the year, based on normal capacity :

Variable overhead :

Department *X*—Rs. 1,20,000 for 9,000 direct labour hours.

Department *Y*—Rs. 1,60,000 for 10,000 direct labour hours.

Fixed overhead :

Total budgeted direct labour hours for the whole factory 22,000.

Total budgeted expenditure Rs. 3,30,000.

You are required to —

(a) Calculate the cost of Job No. 5326.

(b) Estimate the % of profit obtained, if the price quoted to the customer was Rs. 3,000.

6. Mr. Bedisa receives an order to supply cattle feed to his local farmer.

The job passes through three departments, collecting costs being as follows :

Mixing department	100 kg. of Owen at Rs. 2 per kg.
	50 kg of Howe at Re. 1 per kg.
	20 kg. of Benn at Re. 0·50 per kg.
	10 hrs. of labour at Rs. 4 per hr.
Boiling department	20 hrs. of labour at Rs. 3 per hr.
	60 hrs. of the boiling machine.
Cooling and skimming department	50 hrs. of labour at Rs. 2 per hr. Hire of giant thermometer and scoop R . 200.

The job does not disrupt normal activity levels, which are as follows :

Department	Labour hours	Machine hours	Budgeted overhead Rs.
Mixing	200	- -	1 600
Boiling	250	700	9,100
Cooling	550	- -	4,950

Basis of absorption : Mixing— labour hours
    Boiling— machine hours
    Cooling— labour hours

Selling and administrative expenses are 30 per cent of factory cost.

You are required to prepare a statement showing the profit or loss on the job, if the price agreed is Rs. 2,500.

7. Job No. 503 was completed in three departments of a factory. Cost details for this job were :

Department	Direct Materials Rs.	Direct Wages Rs.	Direct Labour Hours
X	650	800	1,000
Y	940	300	400
Z	230	665	700

Works overhead is recovered on the basis of direct labour hours and administration overhead as a percentage of works cost.

The figures for the last period for the three departments on which the current overhead recovery rates are based, were :

Departments :	X	Y	Z
Direct Materials (Rs.)	6,125	11,360	25.780
Direct Wages (Rs.)	9,375	23,400	54,400
Direct Labour Hours (hrs.)	12 500	36,000	64,000
Works Overhead (Rs.)	5,000	7,200	9,600
Administration Overhead (Rs.)	2,870	14,686	8,978

You are required to draw up a Cost Sheet showing the cost of Job No. 503, and to show the price charged, assuming a profit margin of 20% on total cost.

8. *A* Ltd. operates a job costing system which is used also for assisting in estimating prices for new jobs.

Jobs *P* and *Q* are put up to you for the purpose of quoting prices for each job based on the following data :

	Job *P*	Job *Q*
Materials :	Rs.	Rs.
Purchased components	200	280
Materials from stores	100	120

Labour ·

  Hours required in each department :

	Job *P*	Job *Q*
Machining Department	60 hours	30 hour
Assembly Department	20 hours	40 hour
Finishing Department	10 hours	20 hour

Rates of pay for direct labour :

Machining Department	Rs. 1·60 per hour
Assembly Department	Re. 1·00 per hour
Finishing Department	Rs. 1·40 per hour

Factory overheads are recovered on the following basis :

Machining Department	Rs. 4 per direct labour hour
Assembly Department	Rs. 3 per direct labour hour
Finishing Department	Rs. 4 per direct labour hour

Assuming that 20% of factory cost is added for general administration expense and a further 10% of total cost for profits, calculate the prices to be quoted for job *P* and job *Q* (to the nearest rupee).

9. The Alpha Manufacturing Co. processes production through two departments—(i) Machining and (ii) Finishing. Overhead rates are predetermined on the basis of Machine Hours in the Machining Department and on the basis of Direct Labour Wages in the Finishing Department.

The figures for 1988-89 on the basis of which the overhead rates were arrived at, are furnished below :

	Machining Deptt.	*Finishing Deptt.*
Direct labour wages	Rs. 36,00,000	Rs. 40,00,000
Factory overhead	Rs. 80,00,000	Rs. 60,00,000
Direct labour hours	24,00,000	50,00,000
Machine hours	20,00,000	5,00,000

The Cost Sheet for Job Order No. 2732 indicates :

	Machining Deptt.	*Finishing Deptt.*
Materials consumed	Rs. 50	Rs. 7
Direct labour wages	Rs. 45	Rs. 40
Direct labour hours	24	35
Machine hours	15	5

Assuming that the production Order No. 2732 consisted of 10 units of Part No. P-256, prepare a Cost Sheet showing the unit cost of the part.

Re :   Contract Costing

10.   Write up a contract account from the following particulars :

		Rs.
Direct materials		39,600
Wages		26,400
Special Plant		17,600
Stores issued		7,040
Loose tools		3,300
Cost of tractor operation :		
Materials	2,200	
Wages of driver etc.	3,520	
Other charges	2,640	8,360

The contract was completed in 13 weeks at the end of which period plant was returned subject to a depreciation of 15% per annum on the original cost.

The value of loose tools and stores returned were Rs. 2,200 and Rs. 890 respectively. The value of a tractor used in the contract was Rs. 20,000 and depreciation was to be charged to this contract at the rate of 15% per annum. Provide for office overhead at the rate of 10% on total works cost. The contract price was Rs. 1,00,000.

11.   The following particulars relate to a contract for Rs. 1,00,000 for the year ended 31-12-1989 :

	Rs.
Materials issued	30,000
Direct wages	23,000
Direct expenses	2,200
Indirect expenses	600
Materials in hand	5,000
Plant issued	1,400
Work certified	75,000
Work uncertified	800
Cash received	60,000

Prepare a Contract Account, assuming that the plant is to be depreciated @ 50%.   (*C. U., B. Com. Pass—Adapted*)

12.   The following is the position of Contract No. 52 on 31.12.89 :

	Rs.
Materials purchased	1,12,500
Materials in hand (on closing date)	4,500
Wages paid	1,31,250
Wages prepaid	1,875
Indirect Expenses	5,625
Cost of Plant	18,750
Value of work certified	2,70,000
Cash received	2,02,500
Cost of work not yet certified	7,500
Contract price	4,50,000

The plant at site is valued at Rs. 15,000 on 31.12.89.

Prepare the Contract Account taking credit for profit which you think reasonable. *(C. U., B. Com. Pass—Adapted)*

13. The total value of a contract is Rs. 24,00,000 and the position for the year, 1989, in which the contract work started was as under :

	Rs.
Materials	4,00,000
Wages	2,00,000
Overhead Expenses	60,000
Plant	3,00,000
Direct Charges	1,50,000

The plant is to be depreciated by 10%. Rs. 12,00,000 have been received being 80% of the work certified. At the end of the year the work done and not certified was estimated at Rs. 75,000 and Materials lying on site was valued at Rs. 30,000.

Prepare the Contract Account for the year, determining the profit which you consider should be credited to the Profit and Loss Account.

(C. U., B. Com. Hons.—Adapted)

14. The Contract ledger of a company showed the following expenditure on account of Contract No. 235 at 31st December, 1989 :

	Rs.
Materials	47,000
Plant	6,000
Wages	51,500
Establishment Charges	4,350

The contract commenced in January, 1989 and was fixed at a price of Rs. 2,00,000. Cash received on account to date was Rs. 88,000 representing 80% of work certified, the remaining 20% being retained until completion. The value of materials on hand on 31.12.89 was Rs. 2,250 and work finished, but not certified was valued at Rs. 2,000.

Prepare an account in respect of the contract, showing profit to date, assuming depreciation on plant at 10% p.a., and state the proportion of profit the company would be justified in taking to the credit of the Profit and Loss Account for 1989. *(C. U., B. Com. Hons.—Adapted)*

15. The ledger of a contractor disclosed that the following expenditure had been charged to Contract 15A during 1989 :

	Rs.
Materials	1,24,000
Wages	1,70,600
Plant	17,200
Establishment charges	13,400

The contract, which was for Rs. 7,20,000, was signed and work commenced in January, 1989. By 31st December, 1989 cash had been received on account of work done amounting to Rs. 3,24,000 representing 90 per cent of the value of the work certified. On 31st December, 1989

the value of materials unused was Rs. 8,000 and the cost of work completed but not certified Rs. 10,000.

You are required :

(a) to prepare the account for Contract 15A for the year to 31st December, 1989, charging 10 per cent depreciation on plant,

(b) to show what proportion of the profit disclosed might be taken to the credit of the general profit and loss account, giving your reasons for the principle you adopt,

(c) to illustrate how the contract should be shown in the balance sheet as at 31st December, 1989.

16. A building contractor undertook to construct a building for which following details are supplied :

Construction started	Jan. 1, 1989
	Rs.
Total contract price	5,00,000
Raw materials supplied	1,00,000
Direct labour cost	60,000
Other expenses	5,000
Plant installed at site (cost)	80,000
Proportionate overhead expenses	20,000
Materials in hand on closing date	2,000
Expenses incurred but not paid	1,000
Work certified	2,50,000
Work not yet certified	10,000
Cash received from contractee	2,00,000

Prepare Contract Account of the building for the year ending on 31-12-1989 by transferring reasonable profit to Profit and Loss Account after adjusting depreciation on plant at 20% p.a. (*C. U., B. Com. Hons.*)

17. A construction company is working on a contract for the construction of a building. The value of the contract is Rs. 7,20,000 and the work commenced on 1st September, 1988. The balances shown at 1st January, 1989 (on which date the accounting year starts) were as follows :

Debit Balances

	Rs.
Work-in-progress at cost	70,000
Materials on site	32,000
Plant at cost	33,000

Other accounts and details appropriate to the contract for the year 1989 are as follows :

	Rs.
Materials issued to site	1,34,000
Wages paid	1,29,000
Plant sent to site during the year at cost	95,000
Head office overheads	6,000
Sub-contractor's charges not yet paid	90,000
Accrued wages	3,000

	Rs.
Plant hire	8,000
Cash received	4,32.000
Cost of work not yet certified	73.000
Value of work certified as complete	4,80.000
Materials on site at 31.12.89	29,000
Plant on site at 31.12.89 at valuation	1,14,000

You are required to prepare the contract Account showing therein the amount of profit or loss to be transferred to Profit & Loss Account.

/ **18.** MB construction Co. secures a contract to build a technical college at a fixed contract price of Rs. 50,00,000. Completion must be in time to enable starting of the educational session two years hence.

Work commenced on 1st July and at 31st December (closing date) the following details had been recorded in the costing records :

	Rs.
Materials purchased	6,20,000
Wages paid	1,40,000
Other direct charges	1,27,000
Plant sent to site at valuation (1st July)	1,80,000
Value of work measured (to 15th December)	8,60,000
Cash received	7,74,000
Additionally you ascertain :	
Materials on site not used to date	14,000 •
Work completed, but not measured	74,000

Plant is depreciated at 20% per annum against valuation.

(a) Prepare a Contract Account for the period ending on Dec. 31 showing the amount of profit/loss you consider should be taken to the Profit and Loss Account.

(b) Explain why the amount taken to Profit and Loss Account may differ from the normal profit.

(c) Explain the term 'retention money' in connection with contract costing.

19. Senior Ltd. are contractors for construction of a river bridge on behalf of Bridge Corporation. The value of the contract is Rs. 30,00,000. Payment is by engineer's valuation certificate subject to retention of 10 per cent of the amount certified.

The following information is available :

	Rs.
Wages paid	4,12,600
Materials from suppliers	5,89,660
Materials from stores	1,01,800
Hire of plant	2,10,300
Expenses	1,13,950
Materials in hand on closing date	1,16,600
Value of work certified	15,00,000
Work not yet certified	1,26,130
Accrued wages	28,260

You are required to prepare the Contract Account and show the value of work-in-progress.

20. From the following particulars in respect of a particular contract for the year ended 31st December, 1989, prepare Contract Account.

	Rs.
Materials sent to site	1,90,000
Wages paid	1,20,000
Wages Outstanding	5,500
Direct Expenses	0,000
Establishment Charges	52,000
Special plant installed at cost	2,00,000
Cost of work not certified	25,000
Value of special plant as on 31.12.89	1,70,000
Material at site as on 31.12.89	21,000
Total Contract Price	12,00 000
Cash Received	5,94,000
Retention—10% of work certified.	
Sale of Scrap	2,000

General Plant costing Rs. 1,20,000 was used for 3 months. Depreciation on that is to be provided at 15% per annum. (*C. U., B. Com., Hons.*)

21. Mitra & Ghosh Ltd. are contractors for the construction of a pier for the Eastern Development Corporation. The value of the contract is Rs. 3,00,000 and payment is by engineer's certificate, subject to a retention of 10 per cent of the amount certified (this to be held by the Eastern Development Corporation for six months after completion of the contract).

The following information is extracted from the records of Mitra & Ghosh Ltd. :

	Rs.
Wages on site	41,260
Materials delivered to site by supplier	58,966
Materials delivered to site from store	10,180
Hire of plant	21,030
Expenses charged to contract	3,065
Overheads charged to contract	8,330
Materials on site at 30th November, 1989	11,660
Work certified	1,50,000
Payment received	1,35,000
Work-in-progress at cost	
(Not the subject of a certificate to date)	12,613
Wages accrued at 10th November, 1989	2,826

You are to prepare the Pier Contract Account to 30th November, 1989, and to suggest a method by which profit could be prudently estimated.

22. J. K. Construction Ltd., have obtained a contract for construction of a bridge. The value of the contract is Rs. 24 lac and the work commenced on 1st October, 1988. The following details are shown in their books for the year ended 30th September, 1989 :

	Rs.
Plant purchased	1,20,000
Wages paid	6,80,000
Materials issued to site	6,72,000
Direct expenses	16,000
General overheads apportioned	64,000
Wages accrued as on 30-9-89	5,600
Direct expenses accrued as on 30-9-89	2,400
Materials at site as on 30-9-89	8,000
Work not yet certified at cost	28,000
Cash received being 80% of work certified	12,00,000

Life of plant purchased is 5 years and scrap value is nil.

(1) Prepare the contract account for the year ended 30th September, 1989.

(2) Show the amount of profit which you consider might be fairly taken on the contract and how you have calculated it.

23. National Construction Co. Ltd. obtained a contract for the erection of a multi-storied building. Building operations started in July, 1988. The contract price was Rs. 18,00,000. On 30th June, 1989, the end of the financial year, cash received on account was Rs. 7,20,000 being 80% of the amount on the contractee's certificate.

The following additional information is given :

	Rs.
Materials issued to contract	3,60,000
Materials on hand at site as at 30th June, 1989	15,000
Wages	4,93,200
Plant purchased specially for the contract and to be depreciated at 10% per annum	60,000
Direct expenses incurred	25,800
General overhead allocated to contract	15,200
Work finished, but not yet certified– cost	30,000

You are required to prepare the Contract Account and a statement showing the profit on the contract on 30th June, 1989, indicating what proportion of the profit the company would be justified in taking to the credit of the Profit & Loss Account, and to show what entries in respect of the contract would appear in the Balance Sheet.

24. On 1st March 1988, Road Construction Ltd. started contract 1216 —a duel carriageway bypass road for a contract price of Rs. 9,50,000 with completion schedule for 31st December, 1989. The budget cost of the contract was Rs. 8,75,000. Road Construction Ltd. has a financial year end at 31st December. On 31st December, 1989, the figures in the company's books were :

	Rs. 000's
Materials issued to site from store	96
Materials bought direct at site	109
Materials returned to store from site	14

	Rs. 000's
Wages paid at site	149
Plant at cost 1-3-88	60
Hire of plant 1-3-88 to 31-12-88	77
Supervisory salaries	27
Share of Head Office costs	42
Paid to sub-contractors	19
Wages due on 31-12-88	3
Due to sub-contractors 31-12-88	4
Value of work certified 31-12-88	550
Cost of work completed but not yet certified	35
Cash received relating to work certified (balance retention money)	495
Value of materials on site 31-12-88	18

Depreciation on plant should be provided at 20% per annum on cost.

You are required to show the contract account in full with the amount you would recommend to be taken to the company's Profit and Loss Account for the year to 31-12-88, and the work-in-progress figure.

25. Mirik Construction Ltd. entered into a contract to construct a building. The contract value is Rs. 6,50,000 to be realised in instalments on the basis of the value of work certified by the architect subject to a retention of 10%. The work commenced on 1.4.88 but it remained incomplete on 31.12.88 when the final accounts are to be prepared. The facts and figures of the Contract are :

	Rs.
Plant charged to Contract at the commencement	32,000
Materials charged to Contract	1,80,000
Wages paid	87,000
Expenses incurred on the Contract	38,750

Total establishment expenses amounted to Rs. 41,000 out of which 25% is attributable to this Contract. Out of the materials issued to the Contract materials costing Rs. 4,000 were sold for Rs. 5,000. A part of the plant (Cost Rs. 2,000) was damaged on 1.10.88 and the scrap realised Rs. 300 only. Plant costing Rs. 3,000 was transferred to another Contract site on 31.12.88.

Plant is to be depreciated @ 10% p.a. ;

Materials in hand on 31.12.88 Rs. 17,500 ;

Cash received from the Contractee Rs. 3,06,000 ;

Cost of work yet to be certified is Rs. 30,000.

Prepare a Contract Account showing therein the amount of Profit or Loss to be transferred to Profit & Loss Account.

(*C. U., B. Com. Hons. '89*)

26. A building company has started two contracts in the year to 30th September, 1989. Details relating to these two contracts are as follows :

Contract No.	1	2
Date started	*1-3-89*	*1-5-89*
	Rs.	Rs.
Total value of contract	4,00,000	6,50,000
Materials delivered to site by suppliers	37,000	1,74,000
Materials delivered to site from stores	4,500	—
Materials returned to suppliers	—	3,700
Materials returned to stores	2,000	—
Materials on site at 30-9-89	1,400	8,100
Direct labour paid on site	25,500	91,800
Direct wages due on 30-9-89	—	2,300
Direct expenses	7,400	23,500
Plant bought at start of contract	84,000	1,51,200
Payment to sub-contractors	—	62,600
Share of Head Office expenses	3,700	17,100
Cost of work done, but not yet certified	5,000	15,000
Work certified at 30-9-89	1,00.000	3,40,000
Cash received by 30-9-89		
(balance retention money)	96,000	3,25,000

The plant is to be depreciated on straight line basis at 20% per annum.

You are required to show the contract accounts in full with the amounts you would recommend to be taken to the company's Profit and Loss Account for the year to 30-9-89, and the work-in-progress figures. *

27. A construction company works on two contracts during the year ended December 31, 1989. Relevant information relating to these contracts is given below :

	Contract No. 151	Contract No. 152
Date started	Jan. 1, 1989	April 1, 1989
	Rs.	Rs.
Contract value	3,00,000	1,50,000
Work certified at Dec. 31, 1989	1,50,000	1,00,000
Materials delivered by suppliers to site	50,000	70,000
Returns to suppliers	2,000	1,000
Wages	40,000	30,000
Other direct expenses	2,000	4,000
Materials delivered from Company's central stores	7,000	5,000
Plant at cost	10,000	—
Plant hire	—	3,000
Work completed, but not yet certified as at Dec. 31, 1989	9,000	2,000
Materials on site as at Dec. 31, 1989	3,000	1,000
Value of plant on site on Dec. 31, 1989	6,000	—

The company's administration overhead amounted to Rs. 28,000 for the year ; it is to be apportioned to the contracts in proportion to the calendar months each contract has been in progress. The company has received cash from their client for each contract in respect of the work certified

as at December 31, 1989, subject to a retention by the client of 20% on Contract 151 and 10% on Contract 152.

It is the company's practice to reserve one-third of its profit on any contract not yet completed against contingencies, after allowing for the amount retained by the client.

You are required to :

(a) prepare a statement of the profit or loss on each contract, showing the amount to be taken into the company's profit and loss account for the year ending on December 31, 1989 ;

(b) state the value of each contract, as it would appear on the company's balance sheet as at December 31, 1989, showing how you have arrived at those figures.

28. The data given below refer to Contract M05 for the construction of a section of a motorway. The contract commenced on April 1, 1989 at an agreed price of Rs. 1,00,00,000 and was expected to take four years to complete. Retention money was agreed at 10% of work certified. Details of the contract during the first year are as follows :

		Rs. 000's
Direct Materials :	Received on site	2,560
	Returned from site	25
	Lost from site but insured	30
	On site March 31, 1990	335
Direct Wages :	Paid	1,320
	Accrued at March 31, 1990	30
Direct Expenses :	Paid	240
	Accrued at March 31, 1990	10
Plant :	In use on site at cost	2,000
	Valuation at March 31, 1990	1,500
Site Overhead		370
Allocated head office charges		180
Cash received in respect of work certified		4,500
Cost of work completed, but not yet certified		700

You are required to :

(a) prepare the account of the contract ;

(b) evaluate the work-in-progress as at March 31, 1990.

Your evaluation of the account should include an indication of the profit to be taken in the year up to March, 31, 1990.

29. SB Ltd. commenced to erect a supermarket on 1st January, 1989 at a contract price of Rs. 7,50,000. At 31st December, 1989, the contract ledger contains the following balances in respect of this particular contract :

	Rs.
Materials issued	2,23,000
Wages paid	1,04,000
Plant installed	6,500
Direct expenses	7,125
Establishment charges	4,500
Cash received on account	4,50,000

You are also given the following information :

(i) Wages accrued due, but not yet paid Rs. 2,500.

(ii) Architect's certificates have been issued for work certified to a total of Rs. 5,00,000.

(iii) Cost of work not yet certified is Rs. 7,525.

(iv) Included in the materials charged above, are some which had cost Rs. 6,000 and which subsequently proved unsuitable. These were sold for Rs. 7,000.

(v) At 31st December, 1989, plant on site was valued at Rs. 3,900 and materials in hand were valued at Rs. 3,750.

You are required to prepare the Contract Account, showing clearly the profit which you think advisable for transfer to Profit and Loss Account for the year ended 31st December, 1989.

You are also required to show how the various items will be incorporated in the firm's Balance Sheet at 31st December, 1989.

30. Prepare a contract account from the following data :

	Rs.
Materials purchased specifically for the contract	1 21,000
Stores issues	9,500
Materials returned to stores	440
Materials transferred to other contracts	360
Written down value of plant sent to site	24,000
Sub-contract work	8,000
Direct wages	37,000
Direct expenses	4,000
Architect's fees	2,500
Overhead absorbed	6,200
Valuation of work certified by architect	2,00,000

At the end of the accounting year the following valuations were made :

	Rs.		Rs.
Material on site	9,700	Plant on site	18,000
Cost of work done, but not yet certified	7,000	Accrued charges	640
		Pre-payments	200

The amount claimed to the customer is based on the valuation of the work certified by the architect less a retention of 10 per cent.

31. On 3rd January, 1989 Bilcon Ltd. started work on the construction of an office block for a contract price of Rs. 15,00,000 with completion promised by 31st March, 1990. Budgeted cost of the contract was Rs. 12,00,000. The construction company's financial year end was 31st October, 1989 and on that date the accounts appropriate to the contract contained the following balances :

	Rs. (*in thousand*)
Materials issued to site	322
Materials returned from site	28
Wages paid	136
Own plant in use on site at cost	192

	Rs. (*in thousand*)
Hire of plant and scaffolding	144
Supervisory staff : direct	22
indirect	24
Head office charges	126
Value of work certified to 31st October, 1989	800
Cost of work completed, but not yet certified	80
Cash received relating to work certified	660

Depreciation on own plant is to be provided at the rate of $12\frac{1}{2}\%$ per annum on cost. Rs. 4,000 is owing for wages. Estimated value of materials on site on the closing date Rs. 48,000.

No difficulties are envisaged during the remaining time to complete the contract.

You are required to :

(a) Prepare the contract account for the period ended 31st October, 1989, showing the amount to be included in the construction company's profit and loss account :

(b) Explain the reason(s) for including the amount of profit to be shown in the profit and loss account :

(c) Show extracts from the construction company's Balance Sheet at 31st October, 1989 so far as the information provided will allow.

32. The following particulars at September 30, 1989 relate to a contract (agreed price Rs. 3.30,000) started in February of that year. The contractor's financial year ends on September 30 and you are required to prepare the Contract Account for the period from the commencement of the contract to September 30, 1989. Submit your calculation of the amount of profit which the contract shows as transferable to the general profit and loss account.

	Rs.
Materials ordered for the contract and delivered to the site	67,620
Wages paid	48,180
Plant issued to the site (at valuation)	27,000
Materials issued from stores	10,200
Materials transferred to other contract sites	1,320
Cash received on account (being 80% of the value of work certified by the architect)	1,53,600
Direct expenses	3,360
Plant returned to yard (at valuation)	5,700
Plant transferred to other sites (at valuation)	3,600
Proportion of overhead expenses applicable to the contract	7,800
Payments made to sub-contractors	17,100
Materials transferred to this contract from other sites	3,900

At September 30, 1989 :

	Rs.
Valuation of Plant on site	16,200
Materials on site	5,700
Wages accrued on this contract	840
Sub-contract work done, but not paid for	720
Cost of work done, but not yet certified	7,200

33. A construction company has undertaken to construct a bridge. The following particulars relate to the construction for the year ended 31.3.90 :

Materials :	Rs.
Direct purchase	50,000
Issued from stores	10,000
Wages for labour	45,000
General plant in use (Depreciation to be charged @ 10%)	1,00,000
Direct expenses	3,500
Share of general overhead	2,000
Materials in hand at 31.3.90	1,000
Materials lost by fire	500
Salvage value thereof	150
Wages accrued at 31.3.90	5,000
Direct expenses accrued at 31.3.90	500
Value of work certified	1,59,000
Cost of uncertified work	4,500

The value of the contract is Rs. 2,15,000 and it is the practice of the contractee, as per terms of the contract, to retain 10% of work certified.

From the above particulars, prepare the contract account for the year ended 31.3.90.   (*C. U., B. Com. Hons. adapted*)

34. A company signed a contract to build an underground car park at a contract price of Rs. 8,45,000. It was to be completed in two years and to commence on August 1, 1989. The company's financial year ends at December 31, and in the year following the commencement at December 31, 1990 the state of affairs was follows :

	Rs.
Cash received	5,31,000
Retention	59,000
Extra work as certified on December 1, 1990	10,000
Value of work certified at November 30, 1990	5,90,000

At December 31, 1990 the value of the materials on site amounted to Rs. 3,750 and the plant was valued at Rs. 40,000. During the year plant valued at Rs. 43,750 was transferred to another site. No profit had been taken in the first five months of the contract. At the end of the financial year which closed on December 31, 1990 the cost of work completed but not certified amounted to Rs. 12,500. The following expenditure has been recorded :

	Rs.
Plant sent to site	1,11,250
Materials sent by Stores Department	1,875
Direct purchases sent by suppliers	2,60,000
Wages paid	1,25,000
Site general expenses	4,750
Transport charges	3,000
Head Office overhead expenses chargeable to the contract	37,875

The contract specified that charges should be made for work outside the terms and conditions of the contract and that payment was to be made

in full within one month of certification. Wages due to employees at December 31, 1990 amounted to Rs. 6,250.

You are required to :

(*a*) draw up a statement showing the total profit to date and the profit which you consider should be taken to the Profit and Loss Account :

(*b*) calculate the amount of work-in-progress at December 31, 1990 and show how this would appear in the Balance Sheet ;

(*c*) write up the Contract Account as it would appear in the cost ledger, showing work-in-progress among the balances.

35. A contract for the construction of a large block of office was commence by Builders India Ltd. on 1st June, 1989, and in the period ended on 31st March, 1990, expenditure had been incurred as follows :

	Rs.
Purchase of materials	2,15,620
Materials issued from store	17,380
Wages	98,610
Direct expenses	50,050
Administration expenses charged to the contract	21,420
Purchase of plant for the project on June 1, 1989	1,20,000

The stock of materials on the site on 31st March, 1990 amounted to Rs. 18,280 and on that date there were wages accrued amounting to Rs. 7,200.

A sum of Rs. 3,87,000 had been received by the company which was the amount for work completed to 31st January, 1990, less 10 per cent retention money, as certified by the architects.

The effective life of the plant is estimated to be four years. Other expenditure can be regarded as having been incurred evenly over the period.

The practice of the company is to take credit for no more than two-thirds of the profit on work certified (less retention).

Prepare a Contract Account in respect of the project for the period ended 31st March, 1990, and show how you arrive at the amount of profit taken to the credit of the Profit and Loss Account.

36. A railway contractor makes up his accounts to 31st March. Contract No. SER/15 for construction of a culvert between Bhilai and Raipur commenced on 1st July, 1989. The costing records yield the following information at 31st March, 1990 :

	Rs.
Materials charged out to site	31,540
Labour	75,300
Foreman	11,700

A machine costing Rs. 25,000 has been on the site for 73 days. Its working life is estimated at five years and its final scrap value at Rs. 1,000.

A supervisor who is paid Rs. 18,000 per annum has spent approximately six months on this contract.

All other expenses of administration amount to Rs. 17,000.

Materials in store at site at the end of the year cost Rs. 2,500.

The contract price is Rs. 3,00,000. At the end of the year two-thirds of the contract was completed ; the architect's certificate has been issued covering 50% of the contract price, and Rs. 1,20,000 has so far been received on account.

Prepare a contract account showing profit or loss to be included in respect of this contract in the financial accounts to 31st March, 1990.

37. The following is a summary of the expenditure on Job No. 31 to December 31st, 1989 :

	Rs.
Direct wages	6,900
Direct materials	34,000
Stores issued	3,800
Stores returned	550
Sub-contract costs	6,300
Plant	12,000

You obtain the following information :

(1) The job was begun during 1989 and the total contract price is Rs. 60,000.

(2) The architect had certified that four-fifths of the contract had been completed at December, 15th.

(3) Depreciation of plant up to December 15th is Rs. 4,800.

(4) The summary set out above includes items relating to the period since December 15th, as follows :

	Rs.
Wages	700
Materials used	1,620

(5) Materials on site at December, 31st had cost Rs. 5,000 and stores on site had cost Rs. 400.

(6) Establishment charges are 40% on direct wages.

(7) A fine of Rs. 1,000 is likely to be imposed for late completion.

You are required in respect of Job No. 31 :

(a) to prepare a Job Cost Ledger Account ;

(b) to show what profit or loss has arisen on the work certified ; and

(c) to suggest what figures should be taken to the Profit & Loss Account for the year to December 31st, 1989.

38. The following are details of a contract (No. 52A) undertaken by P. K. Ltd. :

Date commenced	July 1, 1988
Date completed	October 31, 1989
Contract price	Rs. 1,00,000

	In 1988 Rs.	In 1989 Rs.
Direct expenditure		
Materials	13,824	24,699
Wages	14,287	30,298
Expenses	944	1,324
	29,055	56,321
Plant purchased for cash at the beginning of contract	12,000	
Payments for plant on hire		2,000
Penalty for failure to complete the work by September 30, 1989		1,000
Cash received	36,000	63,000

The plant purchased for cash was sold for Rs. 3,250 on 31st October, 1989.

The cash received in each year represents the contract price of all work certified in that year less, in the case of uncompleted contracts, 10 per cent for retention and, in the case of the cash received in 1989, the penalty.

When the annual accounts for the year ended 31st December, 1989, were completed, it was expected that the contract would be comp eted by 30th September, 1989, and at that time it was estimated that the realisable value of the plant would be Rs. 3,855 at 30th September, 1989, and that expenditure still to be incurred would total Rs. 53,000, but the necessity to hire plant in 1989 was not foreseen.

For the purpose of the annual accounts :

(a) all depreciation was charged to contract by the straight line method and was calculated by reference to the expected market value of the plant at the completion of the contract ;

(b) credit was taken for that proportion of the estimated profit on uncompleted contracts which the contract price of the work certified bore to the total contract price.

You are required to prepare the Contract Account for the years, 1988 and 1989, showing the transfer to the Profit and Loss Account.

39. Biscom Ltd. commenced business on 1st June, 1989 as building contractors. The following details relate to the three uncompleted contracts in the company's books on 31st May, 1990 :

Contract	X Rs.	Y Rs.	Z Rs.
Cost of work to 31st May, 1990, all certified (see note)	30,470	27,280	13,640
Value of work to 31st May, 1990 as certified by contractees' architects	38,500	22,000	14,300
Progress payments invoiced to 31st May, 1990	33,000	17,600	11,000
Progress payments received by 31st May, 1990	27,500	17,600	11,000
Estimate of final cost including future costs of rectification and guarantee work	33,000	38,500	66,000
Final contract price	41,800	30,800	88,000

Note : The cost of work to 31st May 1990 has been determined after crediting unused materials and the written down value of plant in use.

(a) Prepare a statement showing your calculation for each contract of the valuation of work-in-progress at 31st May, 1990 and of profit (loss) included therein.

(b) Show, as an extract therefrom, the information which should appear in the balance sheet for work-in-progress.

40. You are required to prepare the contract account for the year ended 31st December, 1989, and show the calculation of the sum to be credited to the Profit & Loss Account for that year.

On 1st April, 1989 Bill Ltd. commenced work on a contract which was to be completed by 30th June, 1990 at an agreed price of Rs. 5,20,000

Bill Ltd.'s financial year ended on 31st December, 1989, and on that day expenditure on the contract totalled Rs. 2,63,000 made up as under :

	Rs.
Plant	30,000
Materials	1,24,000
Wages	95,000
Sundry expenses	5,000
Head Office charges	9,000
	2,63,000

Cash totalling Rs. 1,95,000 had been received by 31st December, 1989 representing 75% of the work certified as completed on that date, but in addition, work costing Rs. 30,000 had been completed but not certified.

A sum of Rs. 9,000 had been obtained on the sale of materials which had cost Rs. 8,000, but which had been found unsuitable. On 31st December, 1989 stocks of unused materials on site had cost Rs. 10,000 and the plant was valued at Rs. 20,000.

To complete the contract by 30th June, 1990 it was estimated that :

1. the following additional expenditure would be incurred :

	Rs.
Wages	64,000
Materials	74,400
Sundry expenses	9,000

2. further plant costing Rs. 25,000 would be required :

3. the residual value of all plant used on the contract at the 30th June, 1990 would be Rs. 15,000 :

4. head office charges to the contract would be at the same annual rate plus 10 per cent.

It was estimated that the contract would be completed on time, but that a contingency provision of Rs. 15,000 should be made. From this estimate and the expenditure already incurred, it was decided to estimate the total profit that would be made on the contract and to take to the credit

of the Profit & Loss Account for the year ended 31st December, 1989, that proportion of the total profit as it relates to the work actually certified to that date.

41. A contractor secured a contract to supply and erect machinery for the sum of Rs. 75,000. He was to receive payments on account from time to time equal to 90% of the certified value of the work performed.

He commenced work on January 1st 1989, and incurred the following expenditure during that year : Plant and tools—Rs. 7,000. Machinery and stores—Rs. 20,000, Wages—Rs. 15,000, Sundry expenses Rs. 3,000 and Establishment charges—Rs. 4,000.

A part of the machinery costing Rs. 2,000 was unsuited to the contract and was immediately sold at a profit of Rs. 500.

The value of the plant and tools on December 31st 1989, was Rs. 4,000, and the value of machinery and stores then on hand was Rs. 3,000.

By January 31st 1990, he had received payments on account amounting to Rs. 43,875, being 90% of the certified value of the work done up to the previous December, 31st.

In order to calculate the profit made on the contract to December 31st, the contractor estimated the further expenditure that would be incurred in completing the contract, and took to the credit of Profit & Loss Account for the year, that proportion of the estimated net profit to be realised on the contract which the certified value of work done bore to the contract price.

He estimated :

(a) that the contract would be completed in a further six months ;

(b) that plant and tools would have a residual value of Rs. 1,000 upon the completion of the contract ;

(c) that the cost of machinery and stores required, in addition to those in stock in December 31st, would be Rs. 10,000 and that further sundry expenses of Rs. 2,000 would be incurred ;

(d) that the wages on the contract for the six months to June 30th, 1990, would amount to Rs. 8,000 ;

(e) that establishment charges would cost the same sum per month as in the previous year ; and

(f) that $2\frac{1}{2}$% of the total cost of the contract (excluding this percentage) should be provided for contingencies.

Prepare the contract account for the year ended December 31st, 1989, and show your calculation of the profit to be credited to Profit & Loss Account for the year.

Re : Batch Costing

42. The demand for an item is uniform at a rate of 25 units p.m. The fixed cost is Rs. 30 each time a production is made. The production cost is Rs. 3 per item and the inventory carrying cost is 50 paise per unit

p.m. If the storage cost is Rs. 3 per item p.m., determine how often to make a production run and of what size.

43. Sabana Ltd. undertakes to supply 1,000 units of a component per month for the months of January, February and March 1990. Every month a batch order is opened against which materials and labour costs are booked at actuals. Overheads are levied at a rate per labour hour. The selling price is contracted at Rs. 15 per unit.

From the following data, present the cost and profit per unit of each batch order and the overall position of the order for the 3,000 units.

Month	Batch Output (Numbers)	Material Cost Rs.	Labour Cost Rs.
January 1990	1,250	6,250	2,500
February 1990	1,500	9,000	3,000
March 1990	1,000	5,000	2,000

te of Rs. 2 per hour. The other details ar

Month	Overheads Rs.	Total Labour Hours
January 1990	12 000	4,500
February 1990	9,000	4,500
March 1990	15,000	5,000

Process Costing

Process Costing has been defined by Kohler as "*a method of cost accounting whereby costs are charged to process or operations and averaged over units produced.*"

When production of *similar units* is carried on continuously through a series of processes or operations, the appropriate field for application of the method of process costing is obtained. Process Costing is, therefore, applied in industries where continuous or mass production of standard output is the rule. I.C.M.A., London defines Process Costing as *that form of operation costing, where standardised goods are produced.*

Various Types of Processes

The following are the various types of processes :

(a) *Sequential Processes* : When the finished product of Process I becomes the raw material for Process II, and the finished product of Process II becomes the raw material for Process III, and so on, the processes are called Sequential Processes. The flow of product, in this case, is known as *Sequential Product flow.*

(b) *Parallel Processes* : When each process is independent of the other so that the finished product of one process does not become the raw material for the next process, the processes are known as *Parallel Processes.* Two parallel processes may supply their finished products as raw material for a third process ; but, in that case, there is a sequential relationship between the third process and each of the parallel processes. If X and Y are two parallel processes supplying their finished products to process Z as raw material, each of X and Y has sequential relationship with Z.

Similarly, the finished product of say, process A may be used as the raw material for processes X, Y and Z. Here X, Y and Z are parallel processes each of which has sequential relationship with process A.

The flow of products from parallel processes is known as *Parallel Product flow.*

(c) *Joint Processes* : When different products are obtained from a common process, the process is known as Joint Process. Flow of products from joint process may be called *Joint Product flow.*

(d) *Selective Processes* : In this case, finished product of a process becomes raw material for a number of processes in the same plant, depending upon the final product(s) to be obtained. Let there are four processes A, B, C and D. A receives raw materials from stores. Finished product of A goes, as raw material, to B, C and D. Finished product of B also goes, as raw material to D : finished product of C partly forms final output and partly goes, as raw material to D [i.e., each of A, B and C feeds D]. C and D give out the final outputs. These processes are called *selective processes.* The flow may vary depending upon the final product

or products to be obtained. roduct flow, in this case, is known as *Selective Product flow*.

Types of Process Plants

There may be different types of process plants as enumerated below :

(a) Plants or factories manufacturing only one standard product through several processes *or* each of the various departments under the plant producing one standard product.

(b) Plants or factories manufacturing different products in one process, each product having a separate run as in cases of bakeries, flour mills etc. Costs are compiled separately for each run.

(c) Plants or factories producing, simultaneously, different products through the same process as in case of foundries.

(d) Plants or factories repeating a standard process or operation in one department for mass production as in case of industries manufacturing spare parts, nuts and bolts, petroleum from crude oil etc.

Industries that normally employ process costing

The following is the list of industries which employ process costing :

1. Industries producing steam, gas, electricity, ice, steel, paper, cement, rubber, bread etc.

2. Bakeries, confectioners, flour mills, canners, manufacturers of medicine, steel fabricators etc.

3. Foundries, laundries, dyers, cleaners etc.

4. Industries producing spare parts, fittings, equipment, industries like oil refineries, fertilizer industries.

Job Costing and Process Costing Compared

The points of distinction between Job Costing and Process Costing are presented in the following table :

Job Costing		*Process Costing*
Production is carried on against specific orders.	1.	Production is carried on continuously for stock purpose with a view to selling in the market.
Each job is quite distinct from the other and hence products of one job cannot mix up with that of another.	2.	Since the production is in a continuous flow, products are mixed up in such a way that they are not separable.
No transfer of product usually takes place from one job to another, except in case of over-production.	3.	roducts normally pass from one process to another before they reach the final shape. Usually finished products of one process becomes the raw materials for the next process.

Job Costing		*Process Costing*
Costs are ascertained of each job separately.	4.	Costs are ascertained processwise or departmentwise.
After each job is completed costs are ascertained for the job.	5.	Costs are ascertained for each process or department at the end of a cost period.
There may or may not be any work-in-progress in respect of a job on any closing date.	6.	At the end of a cost period there is every possibility of having work-in-progress which is regarded as the opening work-in-progress in the next cost period.
Total cost being divided by the number of units produced in the lot or batch, gives the unit cost.	7.	Total cost of a period after adjustment for opening and closing work-in-progress being divided by the output of the process during that period, gives the unit cost.
Job costing requires more attention from the management as the production is neither continuous nor standardised.	8.	Process costing requires less managerial attention as compared to that in case of job costing, as the products are standardised.

Advantages of Process Costing

The following advantages of process costing are claimed :

1. Process costing involves less expense and effort on accounting owing to its simple nature.

2. It gives detailed cost of each process, operation or department, budgeted and actual, enabling the management to employ effective control on performance.

3. Overheads may be allocated to departments or processes accurately on definite bases of allocation.

4. Since the production is continuous (or since mass production is of repetitive nature) fairly stable standards may be set for production activities.

5. Process costs can be determined for short periods. The unit cost can be ascertained by dividing the process costs of the period by the number of units produced in that period. Thus, it is possible to ascertain unit cost weekly or even daily, provided overhead recovery rates are predetermined.

6. Price quotation is very easy in process costing, because there is standard material consumption and standard expenses of operations.

Disadvantages of Process Costing

The following disadvantages of process costing have been pointed out :

1. Since cost is ascertained only at the end of a cost period, effective

control on activities cannot be exercised unless standard process costs are used.

2. In case of joint products (i.e., more than one product coming from the same process), the total costs are apportioned to the various products. Thus, the cost of each product cannot be very much reliable.

3. The unit cost, under process costing, represents average cost over a period. So, day-to-day individual efficiency of performance can not be judged.

4. In process costing, work-in-progress has to be valued at the end of each cost period. The process costs after adjustment for work-in-progress being divided by the number of units produced, give the unit cost. Value of work-in-progress, being only an outcome of estimation, renders process costs inaccurate.

Characteristic Features of Process Costing

The following characteristic features of process costing have been observed :

1. Entire factory is divided into a number of processes or departments. Each process or department undertakes a particular operation which is a definite part of the total operations needed to complete production. *Each process or department is treated as a cost centre* and separate cost records are maintained for each cost centre.

2. Materials costs, wages and overheads are collected processwise or departmentwise and charged accordingly.

3. Production data are collected separately for each process.

4. Costs of the production units lost or *normally* spoiled, are ascertained and included in the costs of good units produced.

5. Finished product from one process passes as raw materials to the next process and charges are made accordingly, in order to arrive at the cost of finished product at the end of a cost period.

6. Work-in-progress of each process at the end of a cost period is valued and considered for arriving at the process costs for the period.

7. Unit cost of each process during a period is obtained by averaging the total costs of that period.

8. When more than one product is obtained from a process (i.e., in case of joint products) the total costs of the process during the cost period are apportioned to the products, suitably.

Procedure of Process Costing

For each process a separate account is opened. All direct expenses and indirect expenses relating to the product are debited to the process account concerned. If one process completes the manufacture, the units produced are transferred to finished stock. If finished product of one process is required

by the next process as raw material, the units produced are transferred to the next process account.

The total cost of each process, after adjusting the values of work-in-progress (opening and closing) for each cost period, being divided by the number of units produced by that process during the same period, gives the unit cost, The process account may be ruled with an additional column to show the unit cost.

Routine of Process Accounting

Since most of the items of expenditure can be departmentalised, they can be treated (after departmentalisation) as the direct cost of the process or department. Only a few items of expenditure remain common, which are to be apportioned. Thus, process accounting is much simpler than job accounting.

Let us see how various elements of costs are accounted for in each process.

Materials

In process costing, no distinction is made between direct materials and indirect materials. All materials issued are charged to the process account concerned.

Where the store supplies materials to all the processes (i.e., in case of centralised store), against requisitions or bills of materials, the store maintains a *daily analysis of issues* on the basis of which an *abstract* is prepared for a period and sent to the costing department showing materials issued to different processes or departments during the period.

Where a store supplies to only one process (i.e., in case of decentralised store), the procedure becomes more simple. In this case, how much material is supplied to the process during a period is obtained by formula—*opening stock +receipts closing stock = materials supplied.* If, in this case also, issues are made on requisition, all requisitions served during a period are charged to the process. Sometimes, materials input is ascertained on the basis of output of the process. Let in process *A* the wastage is estimated at 10%. If the output is 90 units the material input is taken at 100 units and so on.

Wages

Wages of all personnel serving exclusively one process or department are charged to that process or department directly. Wages of service departments serving various processes or departments and also those of personnel serving more than one process or department are to be suitably apportioned. Pay-rolls are directly analysed into processes for the purpose of ascertaining wages to be directly charged to each process for a period.

Direct Expenses

Any expense, other than material or wages, being directly traceable to a process is charged to that process directly. (Depreciation on plants, Insurance etc. can be treated in this way.)

Overheads

Any one method of recovery of overhead, already discussed in the relevant chapter on overhead, may be applied to different processes for the purpose of ascertaining the amount of overhead chargeable to each process. The amount of overhead is charged to process account. Overhead is generally recovered in the ratio of wages in the absence of any other more equitable method available.

Let us look into the following illustrations to realise how process accounts are built up.

Illustration 1.

Somnath Ltd. produces a standard article through three successive processes. The following data relate to October, 1989. Prepare Process Accounts, each showing unit cost. The output produced in October, 1989 is 200 units.

	Process I	*Process II*	*Process III*
	Rs.	Rs.	Rs.
Materials consumed	20,000	8,000	3,000
Wages booked	16,000	28,000	18,000
Other direct charges	4,000	10,000	5,000

Overhead amounts to Rs. 15,500 for the period. Overhead is recovered on the basis of direct wages.

Solution :

Workings :

Overhead Recovery –

Process I $\dfrac{16,000}{(16,000+28,000+18,000)} \times$ Rs. 15,500 = Rs. 4,000

Process II $\dfrac{28,000}{(16,000+28,000+18,000)} \times$ Rs. 15,500 = Rs. 7,000

Process III $\dfrac{18,000}{(16,000+28,000+18,000)} \times$ Rs. 15,500 = Rs. 4,500

Total Rs. 15,500

Dr.   **Process I Account**   (Output : 200 units)   Cr.

Particulars	Per unit Rs.	Total Rs.	Particulars	Per unit Rs.	Total Rs.
To Materials	100·00	20,000	By Process II Account	220·00	44,000
„ Wages	80·00	16,000			
„ Direct Expenses	20·00	4,000			
„ Overhead	20·00	4,000			
	220·00	44,000		220·00	44,000

Dr.   **Process II Account**   (Output : 200 units)   Cr.

Particulars	Per unit Rs.	Total Rs.	Particulars	Per unit Rs.	Total Rs.
To Process I Account	220·00	44,000	By Process III Account	485·00	97,000
., Materials	40·00	8,000			
,, Wages	140·00	28,000			
., Direct Expenses	50·00	10 000			
., Overhead	35·00	7,000			
	485·00	97,000		485·00	97,000

Dr.   **Process III Account**   (Output : 200 units)   Cr.

Particulars	Per unit Rs.	Total Rs.	Particulars	Per unit Rs.	Total Rs.
To Process II Account	485·00	97,000	By Finished Goods Account	637·50	1,27,500
,, Materials	15·00	3,000			
,, Wages	90·00	18 000			
, Direct Expenses	25·00	5,000			
., Overhead	22·50	4,500			
	637·50	1,27,500		637·50	1,27,500

Besides preparing Process Accounts as shown above, **Process Cost Sheet** can also be prepared as below :

Process Cost Sheet

Period :   October, '89   Product ....Units produced : 200

Particulars	Process I		Process II		Process III		Total Cost	
	Per unit Rs.	Total Rs.	Per unit Rs.	Total Rs.	Per unit Rs.	Total Rs.	Amount Rs.	Per unit Rs.
Transfer from Previous Process	—	—	220·00	44,000	485·00	97,000	—	—
Materials	100·00	20,000	40·00	8,000	15·00	3,000	31,000	155·00
Wages	80·00	16,000	140·00	28,000	90·00	18,000	62,000	310·00
Direct Expenses	20·00	4,000	50·00	10,000	25·00	5,000	19,000	95·00
Overhead	20·00	4,000	35·00	7,000	22·50	4,500	15,500	77·50
	220·00	44,000	485·00	97,000	637·50	1,27,500	1,27,500	637·50

Note : In the above illustration finished product of one process becomes raw materials for the next process, each process having no work-in-progress.

Valuation of work-in-progress at the end of cost period

In case of continuous mass production where process costing is applied, it is obvious that at the end of each cost period there must be certain incomplete goods at various stages of completion. For example, certain goods may be 75% completed, certain goods may be 50% completed, certain

goods may be only 20% completed etc. The stage of completion, is to be determined first. It is a little difficult job. Stage of completion, in some cases, can be exactly determined on the basis of machine-hours or labour-hours. Suppose 100 machine-hours are required to complete a particular process, but the process has utilised only 70 machine-hours upto the end of the cost period. The process may be said to be 70% completed.

For the purpose of valuation of work-in-progress, the *actual number of incomplete physical units in progress* is substituted by *number of notionally completed units* taking into consideration the degree of completion. 300 incomplete physical units at the stage of 50% completion shall be substituted by 150 notionally completed units. *This is known as the concept of equivalent production.*

If work-in-progress is 100% complete as regards, say, materials, the physical units shall be the same as the notionally complete units as regards materials. If work-in-progress is 50% complete as regards wages, half of physical units shall be equivalent to notionally completed units as regards wages, and so on.

The *total effective production* (or total equivalent production) is the sum of notionally completed units at the beginning *plus* units started and completed during the cost period *plus* notionally completed units at the end of the cost period.

Total cost of the process during the cost period being divided by the *units of effective production* gives the unit cost.

Value of work-in-progress at the end of a cost period is obtained by multiplying the equivalent units in progress at the end of the period by the unit cost ascertained as above.

Let the process cost during a cost period is Rs. 34,200 : number of units started and completed during the period is 800 ; number of units in progress at the end of the period, 75% completed, is 400 and number of units in progress at the beginning of the period, 20% completed, is 200. The effective units of production during the period shall be—

$$\frac{20}{100}\times 200 + 800 + \frac{75}{100}\times 400 \text{ or } 1,140 \text{ units.}$$

The unit cost shall, therefore, be $\frac{\text{Rs. } 34,200}{1,140}$ or Rs. 30.

Value of work-in-progress at the end of the period is--

$$\frac{75}{100}\times 400 \times \text{Rs. } 30 \text{ or Rs. } 9,000.$$

Let us look into the following illustration.

Illustration 2.

Lindwal Ltd. produces a standard product through three distinct processes. 1,000 units of materials had been put into process I at the rate of Rs. 5 per unit. Wages and other manufacturing expenses during the

month of Feb. 1989 for process I amounted to Rs. 3,000 and Rs. 2,000 respectively. 400 units were completed during the month of Feb. 1989 and the remaining 600 units were considered as 100% complete as regards materials and 40% complete as regards wages and other manufacturing expenses as on 28th February, 1989. The process did not suffer any process loss.

You are asked to value the completed units and work-in-progress and prepare Process I Account.

Solution :

Equivalent Units :

Particulars	Materials	Wages	Mfg. Exp.
Completed units (500 Units)	400	400	400
Work-in-progress (600 ,,)	600	240	240
	1,000	640	640

Thus, the total cost shall be apportioned between completed units and work-in-progress as below :

Materials	400 : 600
Wages	400 : 240
Mfg. Expenses	400 : 240

Valuation of completed units and work-in-progress

Particulars	Materials Rs.	Wages Rs.	Mfg. Exp. Rs.	Total Rs.
Completed Units	2,000	1,875	1,250	5,125
Work-in-progress	3,000	1,125	750	4,875
	5,000	3,000	2,000	10,000

Process I Account

Dr. *Period : Feb., '89* *Cr.*

Particulars	Units	Amount Rs.	Particulars	Units	Amount Rs.
To Materials	1,000	5,000	By Process II A/c	400	5,125
,, Wages		3,000	,, Work-in-progress		
,, Mfg. Expenses		2,000	A/c	600	4,875
	1,000	10,000		1,000	10,000

Note : It is needless to mention that *closing work-in-progress of a cost period is the opening work-in-progress of the next cost period.*

Let us look into the problem that we are to face as regards transfer of products to the next process when the transferer process has opening work-in-progress.

We have three ways to assume :

(1) In the current period, the opening work-in-progress is assumed to have been completed first and materials have been introduced later in the process. If the assumption is like this, *the closing work-in-progress shall not include any of the goods included in the opening work-in-progress and all the completed goods transferred to the next process shall include the entire goods representing opening work-in-progress.*

(2) Goods representing opening work-in-progress can not be distinguished from the current period production (i.e., it is assumed that they are mixed up undistinguishably). If the assumption is like this, both finished goods transferred to the next process and the closing work-in-progress shall include elements of opening work-in-progress.

(3) Goods representing opening work-in-progress may be assumed to be still at incomplete stage at the end of the period.

The valuation of the completed goods transferred to the next process as well as that of closing work-in-progress, shall be done on *First-in, First-out Method*, if the first assumption is taken ; on *Weighted Average Method* if the second assumption is taken ; and on *Last-in, First-out Method*, if the third assumption is taken. Let us explain First-in, First-out and Weighted Average Methods in this connection.

Although the third method i.e., last-in first-out (LIFO) method has been named above, it has very little practical application, because incomplete goods at the beginning of a period cannot be expected to remain incomplete even at the end of the period, except in exceptional circumstances. When LIFO is applied all the completed goods are assumed to have come from current input.

First-in, First-out Method

It is assumed that opening incomplete goods are completed and transferred first and then the current period production is completed. So there is no chance that any product included in the opening work-in-progress shall remain incomplete even at the end of the period. Thus, the closing work-in-progress, if any, shall include only the current period products.

Let us look into the following illustration.

Illustration 3.

Lindwal Ltd. produces a standard product which passes through two processes. Prepare Process I Account from the following data and information for March, 1989.

Work-in-progress as on 1.3.89 was 18,000 units (60% complete) valued at Rs. 16,000.

Units introduced during the month 86,000.

Costs are—Materials   Rs. 1,10,000

          Wages   Rs.   60,000

          Overhead   Rs.   46,000

Work-in-progress as on 31.3.89—16,000 units (80% complete). Use first-in, first-out principle.

Solution :

Workings—

1. *Equivalent Production*   *Units*

       Opening work-in-progress $\frac{40}{100} \times 18,000$ 7,200

       (40% to be completed in current period)

       Units introduced and completed in March, '89

          (86,000 – 16,000)   70,000

       Closing work-in-progress $\frac{80}{100} \times 16,000$ 12,800

                                              90,000

Total cost of current period (i.e., Rs. 1,10,000 + Rs. 60,000 + Rs. 46,000 or Rs. 2,16,000) shall be shared by the equivalent production units. Current unit cost is, therefore, Rs. 2,16,000 ÷ 90,000 or Rs. 2·40.

> *Note :* While calculating equivalent product, percentage of work in respect of opening work-in-progress to be done in the current period, is to be considered.

2. *Valuation of goods in opening work-in-progress when completed*

                                                    Rs.

Value (when 60% completed) carried forward   16,000

Cost for further 40% completion $18,000 \times \frac{40}{100} \times \frac{Rs.\ 2,16,000}{90,000}$

         [or $18,000 \times \frac{40}{100} \times$ Rs. 2·40]   17,280

                                                     33,280

                                    [i.e., cost per unit Rs. 1·84]

3. *Valuation of current period goods completed*

          70,000 × Rs. 2·40   Rs. 1,68,000

4. *Valuation of closing Work-in-progress*

    (*including none from opening work-in-progress*) :

         $16,000 \times \frac{80}{100} \times$ Rs. 2·40   Rs. 30,720

Therefore, transfer to Process II Account = Rs. 33,280 + Rs. 1,68,000 or Rs. 2,01,280.

> *Note :* Reconciliation : Cost carried forward + Current period cost
>   = Rs. (16,000 + 2,16,000) = Rs. 2,32,000 represent
>   Value of finished goods (from opening work-in-progress and from current period production) + Value of closing work-in-progress
>   = Rs. [(33,280 + 1,68,000) + 30,720] = Rs. 2,32,000]

Dr.   **Process I Account**   Period : March, '89   *Cr.*

	Units	Com-pletion	Amount Rs.		Units	Com-pletion	Amount Rs.
To Work-in-progress b/f	18,000	60%	16,000	By Process II A/c (18,000+70,000) (Transfer)	88,000	100%	2,01,280
„ Materials	86,000		1,10,000				
., Wages			60,000	„ Work-in-progress c/f	16,000	80%	3",720
„ Overhead			46,000				
	1,04,000		2,32,000		1.04,000		2,32,000

Weighted Average Method

Under this method opening work-in-progress is treated as mixed up in the current production. They are treated as a part of current production, although a part of work was done in the previous period. So the average is worked out after taking into consideration the cost carried forward from previous period plus current period costs and the equivalent production units. While calculating the equivalent production, units completed in the current period including those from opening work-in-progress and also closing incomplete units are to be considered. Let us look into the following illustration.

Illustration 4.

Taking the same data as in illustration 3 above, prepare Process I Account for March, '89, using the weighted average method.

Solution :

Workings—

1. *Equivalent Production*   *Units*

    Units from opening work-in-progress   18,000

    Input during the current period   86,000

    ─────────

    1,04,000

    Less : Closing incomplete units   16,000

    Units completed in the current period   88,000

    Closing incomplete units $\frac{80}{100} \times 16,000$ 12,800

    ─────────

    1,00,800

2. *Average Cost* $= \dfrac{\text{Total Cost}}{\text{Equivalent Production}}$

    i.e., $\dfrac{\text{Rs. } 16,000 + \text{Rs. } 2,16,000}{1,00,800}$ or Rs. 2·3016

3. *Value of Transfer to Process II*

    88,000 × Rs. 2·3016 or Rs. 2,02,540

4. *Value of closing work-in-progress*

    16,000 × $\frac{80}{100}$ × Rs. 2·3016 or Rs. 29,460

Dr. **Process I Account** Period : March, '89 *Cr.*

	Units	Completion %	Amount Rs.		Units	Completion %	Amount Rs.
To Work-in progress b/f	18,000	60%	16,000	By Process II A/c (Transfer)	88.000	100%	2,02,540
,, Materials	86,000		1,10,000	,. Work-in-			
,, Wages			60,000	progress c/f	16,000	80%	29,460
,, Overhead			46,000				
	1,04,000		2,32,000		1,04,000		2 32,000

Thus, First-in, First-out method and Weighted Average method create different values of transfers and work-in-progress. *This difference would not be significant or would totally disappear, if any of the following conditions prevail* :

(a) Absence of opening work-in-progress (i.e., ground for first-in, first-out principle not being available).

(b) Insignificant quantity of opening work-in-progress as compared to the current period input.

(c) Preliminary stage of completion of opening work-in-progress so that previous costs have practically no influence on the current costs.

(d) Stable cost over periods.

As observed above, first-in, first-out method is more complicated than the weighted average method. Both the methods have some *merits* and *demerits* which are briefly mentioned below :

(a) FIFO method segregates past costs from current costs and hence change of cost from period to period can be understood. This is not possible in case of Weighted Average method owing to mixing up of costs.

(b) Weighted Average method is simple to apply. FIFO method is a little more difficult to apply.

(c) FIFO method renders control very effective. Effective control over costs, in case of Weighted Average method, cannot be expected.

(d) When there is process loss, FIFO method cannot be rationally applied. In this case, Weighted Average method can be suitably applied.

Weighted Average method is found widely in use owing to the above-mentioned merits of the method.

Process Loss

Loss in process may be classified into **normal loss** and **abnormal loss**, depending upon the conditions in which loss occurred.

The amount of loss which is unavoidable owing to the nature of raw materials, production technique etc. is taken as normal loss. For example, in the manufacture of certain product punched out of a metal sheet there must be some loss inherent in the production technique. Similarly, there are evaporation, shrinkage, loss in melting etc. which cannot be avoided. This type of loss is termed *normal loss.* Normal loss can be estimated before the production by taking into consideration various factors like type of raw materials, nature of operation, other technical factors etc.

If the actual output exceeds the expected output, it means that normal loss has been less than what was estimated. This excess production is termed *abnormal gain* or *effectives.* Thus, abnormal gain may be said to be equal to diminution of normal loss or it may be defined as the excess of actual output over estimated output.

There may also be loss of a different nature i.e., loss arising out of unexpected or abnormal conditions. This type of loss is termed *abnormal loss.* Substandard materials, breakdown, accidents, wrong plant design, carelessness etc. are the abnormal conditions. Any loss arising out of these conditions may be called *abnormal loss.* Loss exceeding normal loss is treated as abnormal loss.

Truly speaking, normal loss and abnormal loss are relative terms. They widely vary from industry to industry, depending upon the nature of materials used, production technique, preventive measures against incidents etc. Loss of same nature may be treated as normal in some industry and as abnormal in some other industry.

Accounting treatment of normal loss, abnormal loss and abnormal gains in processes.

(a) *Normal Loss*

Cost of the units representing normal loss is borne by the good units produced. If normal loss has any realisable scrap value, such value is credited to the process account. Thus, normal loss is treated by neglect, if there is neither any scrap value nor any abnormal gain. If, however, there is abnormal gain, separate account for normal loss has to be opened (see illustration 5).

(b) *Abnormal Loss*

Cost of the process is to be apportioned between the units lost abnormally and good units in the ratio of such units. The cost of units representing abnormal loss is debited to Abnormal Loss Account and credited to Process Account. Thus, the good units are not to bear abnormal loss. If there is scrap value of the units lost, such value is credited to Abnormal Loss Account and the balance remaining thereafter in that account is written off to Costing Profit & Loss Account.

(c) *Abnormal Gain*

Abnormal gain is not allowed to affect the process cost. The value of units representing abnormal gain is debited to Process Account and

credited to Abnormal Gain Account. At the same time, the scrap value of the units representing normal loss is debited to Normal Loss Account and credited to Process Account. *To the extent of loss of income,* the abnormal gain is transferred to Normal Loss Account and the balance of abnormal gain is transferred to costing Profit & Loss Account.

Units representing abnormal gain are valued as below :

$$\frac{\text{Normal cost of normal output}}{\text{Normal output}} \times \text{Units of abnormal gain}$$

Here, Normal cost of normal output = Total cost of the process—

Scrap value of normal loss ;

and Normal Output = output after normal loss.

Illustration 5.

Lindwal Ltd. produces a standard product through Process I and Process II. Finished product from Process I is used as raw materials for Process II. From the following details prepare necessary accounts.

	Process I	Process II
Input (in units)	15,000	13,000
Materials (in Rs.)	30,000	4,000
Labour (,,)	18,000	15,275
Overheads (,,)	9,000	10,950
Normal loss (estimated)	10%	5%
Scrap value per unit (in Rs.)	2	3

There was no opening or closing work-in-progress. The final output from Process II was 12,500 units

Solution :

Dr.   **Process I Account**   *Cr.*

	Units	Cost Per Unit Rs.	Amount Rs.		Units	Cost Per Unit Rs.	Amount Rs.
To Materials	15,000		30,000	By Normal Loss			
,, Wages			18,000	(10% of 15,000)	1,500	2·00	3,000
,, Overhead			9,000	,, Abnormal			
				Loss	500	4 00	2,000
				,, Process II A/c	13,000	4·00	52,000
	15,000		57,000		15,000		57,000

[*Note* : Normal Cost = Rs. 57,000 — Rs. 3,000 or Rs. 54,000. This is apportioned between 13,000 good units and 500 units of abnormal loss in the ratio of 13,000 : 500. Abnormal loss units = (15,000 — 1,500 — 13,000) or 500 units. Per unit cost of good units as well as that of units of abnormal loss is Rs. 4. (i.e. Rs. 54,000 ÷ 13,500)]

Dr.   **Process II Account**   Cr.

	Units	Cost Per Unit Rs.	Amount Rs.		Units	Cost Per Unit Rs.	Amount Rs.
To Process I A/c	13,000	4·00	52,000	By Normal Loss A/c (5% of 13,000)	650	3·00	1,950
„ Materials			4,000				
„ Wages			15,275	„ Finished Goods A/c (Transfer)	12,500	6·50	81,250
„ Overheads			10,950				
			82,225				
„ Abnormal Gain A/c	150	6·50	975				
	13,150		83,200		13,150		83,200

[*Note* : Normal cost of normal output = Rs. (82,225 — 1,950) or Rs. 80.275

          Normal output = 13,000 — 5 % of 13,000 or 12,350 units

          Units of abnormal gain — 12,500 — 12,350 or 150 units

          Value of Abnormal gain $= \dfrac{\text{Rs. } 80,275}{12,350} \times 150$ or Rs. 975 (i.e., Rs. 6·50 per unit)

          Value of good output per unit - $\dfrac{\text{Rs. } 80,275}{12,350}$ or Rs. 6·50.]

Dr.   **Normal Loss Account**   Cr.

	Units	Per Unit Rs.	Amount Rs.		Units	Per Unit Rs.	Amount Rs.
) Process I A/c	1,500	2	3,000	By Sale	{1,500	2	3,000}
, Process II A/c	650	3	1,950		500	3	1,500}
				„ Abnormal Gain A/c (Loss of income)[1]	150	3	450
	2,150		4,950		2,150		4,950

[*Note* : [1] Loss of income :

          Scrap value of expected normal loss from Process II

          @ Rs. 3 = (650 × Rs. 3)   1,950

      Less : Actual scrap value of actual normal loss (500 × Rs. 3)   1,500

           Loss of Income   450

    Loss of income is equal to abnormal gain units multiplied by rate of scrap value.]

Dr.   **Abnormal Gain Account**   Cr.

	Units	Per Unit Rs.	Amount Rs.		Units	Per Unit Rs.	Amount Rs.
To Normal Loss A/c (Loss of income)	150	3	450	By Process II A/c	150	6·50	975
„ Costing P & L A/c			525				
	150		975		150		975

Dr.   **Abnormal Loss Account**   Cr.

	Units	Per Unit Rs.	Amount Rs.		Units	Per Unit Rs.	Amount Rs.
To Process I A/c	500	4	2,000	By Sale	500	2	1,000
				,, Costing P. & L. A/c			1,000
	500		2,000		500		2,000

Dr.   **Costing Profit & Loss Account** (includes)   Cr.

	Amount Rs.		Amount Rs.
To Abnormal Loss A/c	1,000	By Abnormal Gain A/c	525

Inter-process Profit

Some process industries transfer the finished goods from one process to the next process *at a price above cost.* The excess of the *transfer price* over cost represents inter-process profit. The last process also transfers the finished goods to finished stock account at a price higher than cost. So all processes including the last process make profit from the transfer of products to the subsequent process or finished stock. This profit is called *Inter-process profit.* The profit margin is fixed *at certain percent on transfer price or at certain percent on cost.*

Why the transfer is made at a price higher than cost ?

Transfer at a price higher than cost is claimed to be *advantageous on the following points :*

(i) It reveals process efficiency. For example, the cost of a particular process may be very low and that of a subsequent process may be very high, but the ultimate cost of the finished product may be just what was estimated. Here, the extra efficiency. of the first process cannot be properly realised unless it transfers its product to the next process after taking into consideration the profit in the transfer price. The transfer price including profit may be compared with the market price of the same product at the same degree of completion. If the market price is higher than cost, the process enjoys better standard of efficiency. The industry may choose to sell at this stage instead of further processing. If, however, the market price is lower than cost, the industry may choose to buy instead of producing, after taking also the other factors into consideration.

(ii) If a process gets transfer from the preceding process at a price comparable with the market price, the process may be expected to be alert

on the point that it should finish the product at the estimated cost. Thus, transfer at a price higher than cost helps a process to attain desired level of efficiency.

(iii) By comparing the transfer prices with the corresponding market prices the 'weak' or 'strong' spots in the manufacturing activities can be located and suitable measures can be adopted to improve the conditions wherever necessary.

In short, transfer at a price higher than cost helps—

(a) *Profit planning* (b) *Buy or make decision, and* (c) *Sale or further process decision.* Transfer at a price higher than cost has been *objected to on the following points* :

(i) The profit shown by a process shall be *unrealised* to the extent of profit included in the stock remaining unsold on the closing date of the period.

(ii) In the Balance Sheet, stock is conventionally shown at "cost or market price whichever is less" so that it is acceptable to auditors and tax authorities. Thus, the profit included in stock has to be eliminated from the stock value before they are shown in Final Accounts and Balance Sheet.

(iii) This creates complications in accounting.

So far as objection (ii) above is concerned, a provision on stock may be created for unrealised profit so that stock may be shown in the Balance Sheet subject to deduction therefrom, the amount of unrealised profit.

While working out the amount of unrealised profit in stock, the following points should be borne in mind :

(a) Stock means all stocks in different processes and in Finished goods account.

(b) Stock of the first process does not include profit, because from the total cost, *cost of stock* is deducted to find out the cost of transfer to which profit is added.

(c) The *ratio* of the cost transferred from the former process and the total cost is to be ascertained in respect of each process.

(d) Percentage on transfer price may have to be converted into percentage on cost, wherever necessary.

The ratio of transfer price (to transferee process) to total cost of the transferee process × Closing stock of transferee process × Percentage profit on transfer price made by transferor process equal *to the amount of unrealised profit in the stock of the transferee process.*

The above formula may be used to work out the amount of unrealised profit in the stock of any process ; but this will not help finding out unrealised profit in unsold finished stock.

Alternatively, the process account may be drawn with *three columns* for (i) Total (ii) Cost and (iii) Profit.

The cost of stock in each process may be ascertained by applying the following formulae —

(i) $\dfrac{\text{Cost column total} \times \text{Value of stock}}{\text{Total of total column excluding profit}} = \text{Cost of stock}$.

(ii) Value of stock – Cost of stock = Unrealised Profit.

Illustration 6.

Lindwal Ltd. manufactures a standard product through two successive processes. From the following details prepare the Process Accounts and Finished Stock Account and also calculate the unrealised profits in stocks. State how the profit and stock should appear in the Balance Sheet.

	Process I Rs.	Process II Rs.
Materials	8,000	—
Wages	10,000	18,000
Overheads	4,000	7,000
Closing stock (at factory cost)	2,000	6,000

Closing stocks are valued at prime cost plus overhead. While transferring products from Process I to Process II and from Process II to finished stock a profit of 20% on transfer price is made. Out of the products transferred to finished stock account, goods costing Rs. 5,000 remained unsold as on the closing date and the balance was sold for Rs. 60,000. There was no work-in-progress at the beginning and at the end of the accounting period.

Solution :

Dr. **Process I Account** *Cr.*

	Rs.	Rs.		Rs.
To Materials	8,000		By Process II A/c (Transfer)	25,000
„ Wages	10,000			
„ Overheads	4,000			
Total Cost		22,000		
Less : Closing stock		2,000		
Cost of transfer		20,000		
„ Profit (25% on cost)'		5,000		
		25,000		25,000

Dr. **Process II Account** *Cr.*

	Rs.	Rs.		Rs.
To Process I A/c (Transfer)	25,000		By Finished Stock A/c (Transfer)	55,000
„ Wages	18,000			
„ Overheads	7,000			
Total Cost		50,000		
Less : Closing stock		6,000		
Cost of transfer		44,000		
„ Profit (25% on cost)'		11,000		
		55,000		55,000

Dr.   **Finished Stock Account**   *Cr.*

	Rs.		Rs.
To Process II A/c (Transfer)	55,000	By Sale	60,000
,, Profit & Loss A/c	10,000	,, Balance c/d	5,000
	65,000		65,000

Total profit : Rs. (5,000+11,000+10,000) − Rs. 2,000 (Provision for unrealised profit as shown below = Rs. 24,000.

Calculation of Unrealised Profit in Stocks

(a) *Process I* : Stock of Rs. 2,000 includes no unrealised profit.

(b) *Process II* : Ratio of transfer price of products transferred from Process I and the total cost of Process II is $\dfrac{25,000}{50,000}$ or $\frac{1}{2}$.

Therefore, half of the stock of Process II (i.e., Rs. 6,000) came from Process I i.e., goods costing $\frac{1}{2}$ × Rs. 6,000 or Rs. 3,000 came from Process I on which profit of 20% was made. The unrealised profit is 20% of Rs. 3,000 or **Rs. 600.**

(c) *Finished Stock* : Stock remaining unsold (Rs. 5,000) in finished stock account entirely came from Process II. Process II made a profit of 20% on that i.e., Rs. 1,000. So cost of this stock to Process II is (Rs. 5,000 − 1,000) or 4,000. Out of this, half came from Process I i.e., Rs. 2,000 came from Process I. Process I made a profit on that @ 20%. So unrealised profit is 20% of Rs. 2,000 or Rs. 400. Total unrealised profit in the unsold stock in finished stock account is, therefore, Rs. (1,000+400) or **Rs. 1,400.**

Summary Statement

	Stock	Unrealised Profit	Cost
	Rs.	Rs.	Rs.
Process I	2,000	Nil	2,000
Process II	6,000	600	5,400
Finished Stock	5,000	1,400	3,600
	13,000	2,000	11,000

Provision for unrealised profit amounting to Rs. 2,000 has to be made. In the Balance Sheet, the stock shall be shown in Balance Sheet as below :

Balance Sheet (includes)

	Rs.			Rs.
Profit & Loss A/c	24,000	Stock (2,000+6,000+5,000)	13,000	
(5,000+11,000+10,000−2,000)		*Less* : Provision	2,000	
				11,000

Alternative Solution (*Columnar process accounts*)

Dr.　　　　　　　　　　**Process I Account**　　　　　　　　　　Cr.

	Total Rs.	Cost Rs.	Profit Rs.		Total Rs.	Cost Rs.	Profit Rs.
To Materials	8,000	8.000	—	By Closing Stock	2,000	2,000	—
.. Wages	10,000	10.000	—	,, Finished Stock			
,, Overhead	4,000	4.000	—	A/c—transfer	25,000	20,000	5,000
	22,000						
.. Profit & Loss A/c	5,000	---	5,000				
	27,000	22,000	5,000		27,000	22,000	5,000

Dr.　　　　　　　　　　**Process II Account**　　　　　　　　　　Cr.

	Total Rs.	Cost Rs.	Profit Rs.		Total Rs.	Cost Rs.	Profit Rs.
To Process I A/c	25,000	20,000	5.000	By Closing Stock	6,000	5,400[1]	600
Wages	18,000	18,000	--	,, Finished Stock			
. Overhead	7,000	7 000		A/c- transfer	55,000	39,600	15,400
	50,000						
. Profit & Loss A/c	11,000	---	11,000				
	61,000	45,000	16,000		61,000	45,000	16,000

Dr.　　　　　　　　　　**Finished Stock Account**　　　　　　　　　　Cr.

	Total Rs.	Cost Rs.	Profit Rs.		Total Rs.	Cost Rs.	Profit Rs.
To Process II A/c	55,000	39,600	15,400	By Closing Stock	5,000	3,600[2]	1,400
.. Profit & Loss A/c	10,000	-	10,000	,, Sales	60,000	36,000	24,000
	65,000	39,600	25,400		65,000	39,600	25,400

Notes :

1. Cost of Closing Stock of Process II

$$= \frac{\text{Cost column total}}{\text{Total of total column excluding Profit}} \times \text{Stock value}$$

　　or　$\dfrac{\text{Rs. } 45,000}{\text{Rs. } 50,000} \times \text{Rs. } 6,000 = \text{Rs. } 5,400$.

So, unrealised profit = Rs. 6,000 − Rs. 5,400 = Rs. 600.

2. Cost of Closing Stock in Finished Stock A/c

$$= \frac{\text{Cost column total}}{\text{Total of total column excluding profit}} \times \text{Stock value}$$

　　or　$\dfrac{\text{Rs. } 39,600}{\text{Rs. } 55,000} \times \text{Rs. } 5,000 = \text{Rs. } 3,600$.

So, unrealised Profit = Rs. 5,000 − Rs. 3,600 = Rs. 1,400.

Total unrealised Profit—For Process I	Nil
——For Process II	Rs. 600
——For Finished Stock	Rs. 1,400
	Rs. 2,000

In the above illustration, process stocks have been valued at *factory cost*. If the process stocks are valued at *prime cost, inspite of the presence of overhead*, the ratio of transfer price (to the transferee process) to the prime cost (instead to total cost) shall be taken for the purpose of calculating the unrealised profit in process stocks. Let us look into the following illustration.

Illustration 7.

Somnath Ltd. produces an article through two processes *A* and *B* after which the article is transferred to finished stock. Finished articles of Process *A* is transferred to Process *B* at a profit of 25% on the transfer price and that of Process *B* is transferred to Finished Stock Account at a profit of 20% on the transfer price.

Process stocks are valued at *prime cost, although overhead expenses are incurred*. There is no opening or closing work-in-progress, nor there is any opening balance of finished stock account.

From the following details prepare Process Accounts, Finished Stock Account and calculate the amount of provision to be created on stocks.

	Process A	Process B
	Rs.	Rs.
Materials consumed	15,000	9,000
Wages paid	20,000	15,000
Overhead expenses	5,000	4,000
Stock (at prime cost on closing date)	4,000	5,000

Goods costing Rs. 8,750 remained unsold in finished stock account and the balance of the goods transferred to finished stock account from Process *B* sold for Rs. 1,00,000.

Solution :

Dr. **Process A Account** *Cr.*

	Rs.	Rs.		Rs.
To Materials	15,000		By Process B A/c	
,, Wages	20,000		(transfer price)	48,000
Prime Cost	35,000			
Less : Closing Stock	4,000			
		31,000		
, Overhead		5,000		
Cost of transfer		36,000		
,, Profit & Loss A/c (33⅓% on Cost i.e., 25% on transfer price)		12,000		
		48,000		48,000

Dr. **Process B Account** *Cr.*

	Rs.	Rs.		Rs.
To Process A A/c (transfer)	48,000		By Finished Stock A/c (transfer price)	88.750
„ Materials	9,000			
„ Wages	15.000			
Prime Cost	72.000			
Less : Closing Stock	5 000			
		67 000		
., Overheads		4,000		
Cost of transfer		71,000		
Profit & Loss A/c (25% on cost i.e., 20% on transfer price)		17,750		
		88,750		88,750

Dr. **Finished Stock Account** *Cr.*

	Rs.		Rs.
To Process B A/c (transfer)	88,750	By Sales	1,00,000
„ Profit & Loss A/c	20,000	., Closing Stock c/f	8,750
	1,08,750		1,08,750

Provision to be created— Rs.

    Stock of Process *A* Rs. 4,000   Nil

    Stock of Process *B* Rs. 5,000

    (profit made by Process *A*)

$$\left[\frac{25}{100} \times \text{Rs. } 5,000 \times \frac{48,000}{72,000} \right]$$ 833

    Stock in Finished Stock A/c (Rs. 8,750)   Rs.

    (a) 20% of 8,750   1,750

    (b) $\frac{25}{100} \times \text{Rs. } 7,000^1 \times \frac{48,000}{72,000}$ 1,167

                                        2,917
                                        3,750

[*Note* : 1. Rs. (8,750 - 1,750) or Rs. 7,000 represents cost to Process B]

Let us now look into an illustration relating to production passing through *three* processes.

Illustration 8.

Lindwal Ltd. produces a standard product through three successive processes after which the product passes to finished stock. Each process passes its output to the next process at a price to show a profit of 20% on the transfer price. Process III passes its output to Finished Stock Account on the same basis.

The following data relate to the year ended 31st December, 1989 :

	Process I	Process II	Process III
	Rs.	Rs.	Rs.
Materials consumed	30,000	35,00ᴜ	70,000
Wages paid	50,000	40,000	80,000
Stock on 31.12.89 at prime cost	20,000	30,000	60,000

There was no opening Finished Stock or Work-in-progress, nor there was any closing Work-in-progress. Out of the goods transferred by Process III to finished stock account, goods worth Rs. 2,60,000 was sold for Rs. 4,00,000 ; the balance remained in stock on 31.12.89.

Prepare process accounts and finished stock account showing the amount of unrealised profit in stock in each case separately.

Solution :

Dr.   **Process I Account**   *Cr.*

	Total Rs.	Cost Rs.	Profit Rs.		Total Rs.	Cost Rs.	Profit Rs.
To Materials	30,000	30,000		By Stock c/d	20,000	20,000	—
,, Wages	50,000	50,000	—	,, Process II A/c	75,000	60,000	●15,000
,, P. & L. A/c	15,000	—	15,000				
	95,000	80,000	15,000		95,000	80,000	15,000

Dr.   **Process II Account**   *Cr.*

	Total Rs.	Cost Rs.	Profit Rs.		Total Rs.	Cost Rs.	Profit Rs.
To Process I A/c	75,000	60,000	15,000	By Stock c/d	30,000	27,000¹	3,000
,, Materials	35,000	35,000	—	,, Process III			
,, Wages	40,000	40,000	—	A/c	1,50,000	1,08,000	42,000
,, P. & L. A/c	30,000	—	30,000				
	1,80,000	1,35,000	45,000		1,80,000	1,35,000	45,000

Dr.   **Process III Account**   *Cr.*

	Total Rs.	Cost Rs.	Profit Rs.		Total Rs.	Cost Rs.	Profit Rs.
To Process II A/c	1,50,000	1,08,000	42,000	By Stock c/d	60,000	51,600²	8,400
,, Materials	70,000	70,000	—	,, Finished			
,, Wages	80,000	80,000	—	Stock A/c	3,00,000	2,06,400	93,600
,, P. & L. A/c	60,000	—	60,000				
	3,60,000	2,58,000	1,02,000		3,60,000	2,58,000	1,02,000

Dr.   **Finished Stock Account**   **Cr.**

	Total Rs.	Cost Rs.	Profit Rs.		Total Rs.	Cost Rs.	Profit Rs.
To Process III A/c	3,00,000	2,06,400	93,600	By Stock c/d	40,000	27,520*	12,480
,, P. & L. A/c	1,40,000	—	1,40,000	,, Sale	4,00,000	1,78,880	2,21,120
	4,40,000	2,06,400	2,33,600		4,40,000	2,06,400	2,33,600

Notes :

1. Cost of Stock of Process II $= \dfrac{\text{Cost column total}}{\text{Total of total column excluding profit}} \times$ Rs. 30,000

   or $\dfrac{1,35,000}{1,50,000} \times$ Rs. 30,000 or Rs. 27,000.

2. Cost of Stock of Process III $= \dfrac{2,58,000}{3,00,000} \times$ Rs. 60,000 or Rs. 51,600.

3. Cost of Finished Stock $= \dfrac{2,06,400}{3,00,000} \times$ Rs. 40,000 or Rs. 27,520.

Unrealised Profit in Stock :	Rs.	Realised Profit :	Rs.
Process I	Nil	Process I	15,000
Process II (30,000 − 27,000)	3,000	Process II	27,000
Process III (60,000 − 51,600)	8,400	Process III	51,600
Finished Stock (40,000 − 27,520)	12,480	Finished Stock	1,27,520
	23,880		2,21,120

[Total profit = Rs. (15,000 + 30,000 + 60,000 + 1,40,000) or Rs. 2,45,000 (realised + unrealised)].

By-products and Joint Products

When two or more products are obtained from a common process one of the products may be a *major product* and the other or others may be *by-products.* Which of the products is a major product and which are by-products is a matter of classification depending upon :

    (a)   the relative importance of the products,

    (b)   management outlook,

    (c)   management policies,

    (d)   need for further processing,

    (e)   the relative sales value of the products...etc.

If, from a common process two or more products, each of significant value and volume in relation to total sales value and volume, are obtained, none of the products can be regarded as major product, because, each product is more or less of same importance with regard to value, volume etc. Such products are termed 'Joint Products'. I.C.M.A., London, defines *Joint Products as............"two or more products separated in the course of processing, each having a sufficiently high saleable value to merit recognition as a main product e.g., a petroleum industry gives several joint products like gasolene, kerosene, naptha, fuel oil etc."*

On the other hand, where the sales revenue of one or more of the products is *insignificant* or *relatively minor* in importance in relation to total sales revenue, such product or products may be termed by-product(s).

A by-product is defined by the I.C.M.A., London, as "Net realizable value" i.e., estimated selling price less trade discounts less all costs incurred thereon after separation from the main product.

If there is a market change due to which a by-product may gain in importance and value, it may be ultimately regarded as a joint product. Similarly, if due to a market change a major product loses importance and value, it may ultimately turn into a by-product.

By-products and Joint Products distinguished

The following are the points of distinction :

(a) Joint products are equal in importance, while a by-product is of insignificant importance as compared to that of the main product.

(b) Two or more products being produced *simultaneously* (e.g., mutton and wool) are joint products , but a product *incidentally* produced in course of manufacture of a desired product (e.g., coal gas is incidentally produced while manufacturing coke) is a by-product.

(c) Joint products are the objectives of manufacture ; while by-products are incidentally obtained in the course of manufacture. So according to difference in objectives, products treated as joint products by one industry may be treated as by-products by another industry and *vice versa*.

(d) Joint products are more or less of equal sales value, while by-products are of insignificant sales value.

[*Note* · Joint products are equal as regards importance, sales value and objectives of the industry. They differ from *co-products* on the point that co-products need not arise from the same operation or same raw materials and the quantity of any of the co-products may be changed without changing the others. In an automobile industry jeeps, trucks, cars are co-products.]

Defectives, Scraps, Spoilage and Wastes

Defectives :

Products not being upto the standard and not meeting dimensional specification are termed "Defectives". Defectives may arise due to any one or more of the causes like, improper material, bad worksmanship, faulty supervision, improper inspection, improper work planning etc. Defectives may be re-worked or reconditioned by incurring additional cost and brought to standard or little below standard.

Accounting treatments of defectives :

The accounting treatment shall vary according to circumstances explained below :

(a) Where 'defectives' or 'seconds' have normal value and where quantity of defectives, rectified subsequently, is normal, *the loss is*

absorbed by the good units i.e , the proceeds of defectives are credited to the process account.

(*b*) Where responsibility for defectives cannot be located to any department, *the rectification cost is treated as general overhead.*

(*c*) Where the responsibility for defectives can be located to any department, *the rectification cost is treated as overhead of that department.*

(*d*) Where the defectives are of abnormal quantity and arising out of uncontrollable causes, *the rectification cost is written off to costing profit and loss account.*

If, however, the defectives can be traced with a particular job *the cost of rectification is charged to that job.*

Control of defectives are to be exercised on (1) production and (2) rectification. Standards should be set for defectives and rectification costs. Actuals should be compared with corresponding standards. Reports on Defectives should be prepared for the purpose of control.

Scraps :

Scraps refer to incidental residue obtained from some types of manufacture, which are saleable without further processing, for small value.

Accounting treatments of scraps :

(*a*) Scraps of negligible value is *treated by neglect* i.e., the loss is borne by the good units. When scraps are sold after being treated in this way, the proceeds are treated as other income.

(*b*) Where scraps cannot be traced with any job or process, the proceeds of scraps are credited to overhead so that overhead rates are reduced.

(*c*) When the scraps of significant value can be traced with any job or process, the Scraps Account is debited and the particular job or process account is credited with full cost of the scraps. When the scraps are sold, the proceeds are credited to Scraps Account transferring therefrom profit or loss, if any, to Costing Profit and Loss Account.

For the purpose of *control*, preparation of *scrap report* should be made compulsory. Control should be exercised not only on manufacture, but upon production design as a whole, which includes procurement of material, employment of equipment and personnel etc. Standard for scraps should be set up for comparison with actuals.

Spoilage :

Spoilage refers to damage of materials (in course of manufacture) which can not be economically rectified and hence taken out of the process for disposal in some way without further processing.

Accounting treatment of spoilage :

Spoilage may be *normal* and *abnormal*. Normal spoilage occurs due to causes inherent in operation, while abnormal spoilage occurs due to causes not inherent in operation. Costs of normal spoilage are included in production cost. This is done in two alternative ways—(1) by charging the loss to production order or (2) by charging the loss to overhead. The costs of abnormal spoilage are excluded from production cost and are transferred to Costing Profit and Loss Account. In the former case, if spoilage realise any value, such value is credited to the Production Order or Overhead as the case may be.

Sometimes customer's specification is very rigid so that any production not satisfying the specification is liable to be regarded as spoilage. In this case, the cost of spoilage should be borne by the good units.

Control of spoilage should be done through compulsory preparation of *Spoilage Report,* setting standards for spoilage and comparing the actuals with standards.

Wastage :

Wastage refers to basic raw materials lost in course of manufacture, rendering no realisable value. Wastage may be *invisible* (e.g., due to shrinkage, evaporation etc.) or *visible* (e.g., waste in the forms of smokes, dusts etc.). Sometimes visible wastes may fetch very nominal value.

Accounting treatment of wastes :

Normal wastes are absorbed by good units, but costs of abnormal wastes are written off to Costing Profit and Loss Account. When wastes bring sales value, such value is credited to process account. Sometimes, such value, being insignificant, may be treated as miscellaneous income.

Control should be exercised on purchase, storage, production, inspection etc. Preparation of Waste Reports should be made compulsory. Estimates of wastes should be made before production, on the basis of past experience and actual wastes should be compared with estimated wastes.

Accounting for by-products

Before discussing 'accounting for by-products' we should bear in mind two things—(a) whether by-product is relatively less important than joint product and (b) whether by-product has a more or less steady market value which is not so much significant as that of the main product, but is more significant than that of scraps or wastes. There may be further processing of by-products.

Accounting problem consists in—(1) assignment of cost to by-products and (2) deducting the cost of by-products from the total cost so that unit cost of the main product can be arrived at.

There are various methods used for by-product accounting. They can be grouped under two distinct heads as below :

(A) NON-COST METHODS and (B) COST METHODS

A. NON-COST METHODS

The following methods are included under this head :

(a) Other income method.

(b) Crediting sales value to total cost (Cost of production or cost of sales) method.

(c) Crediting sales value after deducting selling and distribution expenses of by-products.

(d) Crediting sales value less post-separation cost.

(e) Reverse cost method.

B. COST METHODS

The following methods are grouped under this head :

(a) Opportunity cost or replacement cost method.

(b) Standard cost method.

(c) Apportionment or appropriate basis.

Let us discuss each of the above briefly.

Non-cost Methods

4(a) Other income method

Under this method the sales value of by-products is not credited to process account, but is credited to Profit & Loss Account as miscellaneous or other income. This method can be justified in the following circumstances.

(i) Sales value of by-product is very small.

(ii) Costing of by-product is undesirable owing to clerical cost involved.

(iii) Due to non-costing of by-product the unit cost of the main product is not materially affected.

A(b) Crediting sales value to total cost method

Under this method the sales value of by-product is either credited to total cost of production or to cost of sales.

The following illustrations will explain.

(i) *Crediting sales value to production cost*

	Rs.	Rs.	Rs.
Sales value of 4,000 units of main product @ Rs. 4			16,000
Less : Cost of production—			
Cost of 4,500 units @ Rs. 3		13,500	
Less Value of by-product		900	
Net production cost		12,600	
Less Closing stock 500 units @ Rs. 2·80			
$\left[\text{i.e., } \dfrac{\text{Rs. } 12,600}{4,500} \times 500\right]$		1,400	11,200
Gross profit			4,800
Less : Selling and distribution expense			1,100
Net profit			3,700

(ii) *Crediting sales value to cost of sales*   **Rs.**

Sales value of 4,000 main unit @ Rs. 4   16,000

Less : Cost of Sales :   **Rs.**

   Production cost of 4,500 units @ Rs. 3   13,500

Less : Closing stock of 500 units @ Rs. 3   1,500

                                                            12,000

   Less : Value of by-products   900   11,100

   Gross Profit   4,900

Less : Selling and distribution expenses   1,100

   Net Profit   3,800

A(c) Crediting sales value after deducting selling and distribution expense of by-products

Under this method selling and distribution expense incurred in connection with sale of by-products is deducted from the sales value of by-product for crediting to Process Account

A(d) Crediting sales value less post-separation cost

Under this method, from the Sales Value of by-products the post-separation cost and selling and distribution overhead relating to sale of by-product are deducted for crediting to the process account to arrive at the cost of the main product. The following illustration will explain.

                                                                            Rs.

Cost of main products at the point of separation   14,000

Add : Further cost on the main products   3,500

   Total cost of main products   17,500

Less : By-products—   **Rs.**

   Sales value   800

Less : Further cost on by-product after separation   200

                                                            600

Less : Selling and distribution

   expense thereon   100

                                                                            500

   Net total cost of main products   17,000

A(e) Reverse cost method

Under this method the profit in the Sales Value of by-products as well as the cost incurred on the by-product after separation from the main product, is deducted from the Sales Value of the by-products in order to ascertain the cost of the by-product to be credited to process account. This method is also known as *'Crediting Sales Value less profit method* or *Reversal cost method.'* The problem is that, actual profit is not available. Hence, a suitable percentage of profit is assumed. The following illustration shall explain.

Illustration.

In a factory the main product is *M*, but a by-product *B* is also obtained. From the following particulars ascertain the net profit from the sale of *M* and *B* for the period ending on 31.12.89.

(a) Total cost upto split off point Rs. 96,000.

(b) Sales—*M* Rs. 1,68,000 and *B* Rs. 20,000.

(c) Cost after split off—*M* Rs. 18,000 and *B* Rs. 5,000.

(d) Estimated net profit percentage on sales value for *B*, 20%.

(e) Estimated selling expense, as a percentage on Sales Value, 10% in both the cases.

Solution :

Cost of B at the point of split-up

	Rs.
Sales value	20,000
Less : Net profit (20%)	4,000
	16,000
Less : Selling expense (10%)	2,000
	14,000
Less · Cost after separation	5,000
Cost at point of split off	9,000

So, cost of *M* at the point of split off is Rs. 96,000 — Rs 9,000 or Rs. 87,000

Profit and Loss Statement

	Total Rs.	M Rs.	B Rs.
Cost upto spilt off point	96,000	87,000	9,000
Add : Cost after split off	23,000	18,000	5,000
Total Cost	1,19,000	1,05,000	14,000
Sales value	1,88,000	1,68,000	20,000
Gross Profit	69,000	63,000	6,000
Less : Selling expense (10% of sales value)	18,800	16,800	2,000
Net Profit	50,200	46,200	4,000

Cost Methods

B(a) *Opportunity Cost or Replacement Cost Method*

Where the factory uses the by-product from a process as material for another process or purpose, the by-product may be valued at a cost which would have been incurred, had such by-product been bought from outside source. This is known as *Opportunity Cost or Replacement Cost*. For example, in cotton textile industries the cotton wastes arising out of spinning may be used as raw material for the manufacture of cotton blankets etc. or may be used for wiping machines. The cost which the cotton textile industry would have incurred for purchases of cotton wastes from outside source for manufacture of blankets or for wiping machines, represents

opportunity cost. The opportunity cost of cotton wastes is credited to spinning process.

It should be mentioned here that, where by-products increase in volume (correspondingly reducing the main product) so that it becomes significant as compared with the total cost, it should be treated as a 'joint product'.

B(b) *Standard Cost Method*

Under this method a standard value is set for the by-products and the process account is given credit for that value. Standard Cost Method enables better control over the cost of the main product, owing to credit of a stable figure (i.e., Standard Cost) to process account in respect of by-products.

B(c) *Apportionment or Appropriate Basis*

Under this method the total cost upto split-off point is apportioned between the main product and the by-product on some appropriate basis, allowing some weightage based on importance of the main product and that of the by-product. The basis may be chosen from the different bases used for separation of costs in case of joint products (discussed herein after).

Accounting for joint products

The main problem of accounting for joint products is to apportion the joint cost upto the point of separation (or, split-off point) between the products. Further costs after separation are directly allocated to the respective products.

For the purpose of discussing the procedures of apportionment, we may assume mainly two circumstances :

(i)   All the products obtained from a process are significant (i.e., there is no by-product, the products are only joint products).

(ii) The products obtained from a process include joint products and by-products.

Need for apportionment

Total costs must be apportioned between the joint products (and by-products, if any), otherwise the valuation of closing stock of each product, price fixation for each product and ascertainment of profit or loss in respect of each product, shall not be reliable.

Bases of apportionment of joint costs

The bases discussed hereunder, are only ones used generally, although there may not be much scientific value in them.

(a)   Relative sales value basis

(b)   Physical measure basis

(c)   Average unit cost basis

(d)   Technical evaluation or survey basis

(e) Standard cost basis

(f) Marginal cost and contribution basis.

Let us discuss each of the above.

(a) Relative sales value basis

The common costs upto split-off point are apportioned between the joint products on the basis of the sales value of the products. This principle is known as *"what the traffic can bear."*

For this purpose, any one of the following may be taken :

(i) Selling price (ii) Sales value (i.e., quantity × price) (iii) Sales less cost after split-off (iv) Sales less value increased after split-off (including profit therefrom).

Each of the above may be illustrated as below :

Illustration :

Let the joint costs of joint products *X*, *Y* and *Z* amount to Rs. 50,000 ; Selling price per unit—*Y* Rs. 2, *Y* Rs. 2, and *Z* Re. 1 ; Post-split-off cost per unit—Re. 0·30, *Y* Re. 0·40 and *Z* Re. 0·10 ; Assumed profit is 20% on the post-split-off cost · Quantity, in units, of products produced and sold— *X* 17,500 ; *Y* 10,500 and *Z* 14,000.

Solution :

(i) On the basis of selling price

Products	Selling price per unit (Rs.)	Cost Ratio	Apportioned Cost (Rs.)
X	2	2/5	20,000
Y	2	2/5	20,000
Z	1	1/5	10,000
		Joint Cost	50,000

(ii) On the basis of sales value

Here the ratio is taken on the basis of selling price × quantity.

Product	Production & Sales (units)	Selling price Rs.	Sales value Rs.	Sales value Ratio	Apportioned cost Rs.
X	17,500	2	35.000	5/10	25,000
Y	10,500	2	21,000	3/10	15,000
Z	14,000	1	14,000	2/10	10,000
				Joint Cost	50,000

(iii) On the basis of sales less cost after split-off

Products	Production & Sales (units)	Selling price Rs.	Cost after split-off Re.	Selling price less cost after split-off Rs.	Sales value at split-off point Rs.	%
X	17,500	2	0·30	1·70	29,750	50·3
Y	10,500	2	0·40	1·60	16,800	28·4
Z	14,000	1	0·10	0·90	12,600	21·3
					59,150	100·0

.. Joint cost of Rs. 50,000 shall be apportioned to products *X*, *Y* and *Z* as 50·3%, 28·4%, and 21·3% respectively

Products	% of apportionment	Apportioned Cost (Rs.)
X	50·3	25,150
Y	28·4	14.200
Z	21·3	10,650
	Joint Cost	50,000

(iv) On the basis of sales less value increased after split-off :

(1) Product	(2) Production and Sales (units)	(3) Selling price	(4) Post-split-off cost per unit	(5) Value increased i.e., post-split-off cost + profit thereon @ 20%
		Rs.	Re.	Re.
X	17,500	2	0·30	0·36
Y	10,500	2	0·40	0·48
Z	14,000	1	0·10	0·12

Product	(6) Selling price at split-off point	(7) Sales value at split-off point (2 × 6)	(8) Percentage of sales value at split-off point	(9) Apportioned Cost
	Rs.	Rs.		Rs.
X	1·64	28,700	50·4	25,200
Y	1·52	15,960	28·0	14,000
Z	0·88	12,320	21·6	10,800
		56,980		50,000 (Jt. cost)

(b) *Physical measure basis*

Under this method the joint cost is apportioned to the products in the ratio of some physical coefficient present in the products. The physical coefficient may be the raw materials contained in the products in terms of weight, linear measurement, calories, volume etc. The process loss is to be borne by the joint products. Practical application of this basis may be very difficult, if the nature of the joint products is quite different.

(c) *Average unit cost basis*

Where all the end-products can be expressed in terms of a common unit, the total cost of the process upto split-off point may be divided by the total number of units produced, to obtain the Average Unit Cost. The method is simple. All the joint products will have the same average cost. If price is fixed on the basis of average cost, all the products will have, more or less, the same price. The better products and the inferior products will have no difference in prices. Again, if all the joint products can not be

expressed in terms of a common unit, the method can not be applied. For example, one product may be solid, other may be liquid or gaseous.

Let us look into the following illustration.

Illustration.

Mohan Chemicals Ltd. obtained three joint products X, Y and Z from a process. Cost upto the point of separation of the products amounted to Rs. 50,000. Other particulars are as below :

Products	No. of units produced	Units of raw material used
X	700	200
Y	500	300
Z	300	500
	1,500	1,000

Apportion the joint cost of Rs. 50,000 to products X, Y and Z—on the basis of (i) Physical measurement (ii) Average unit cost

Solution :

(i) *On the basis of physical measurement*

The physical coefficient is the raw material contained in the products. Total units of raw material = 1,000 ; total cost = Rs. 50,000.

∴ Cost per unit of raw materials = Rs. 50,000 ÷ 1,000 or Rs. 50.

The apportionment of joint cost shall be as below :

Products	Material units used	Cost per unit of material Rs.	Apportioned cost Rs.	Apportioned cost per unit Rs.
X	200	50	10,000	14·29
Y	300	50	15,000	30·00
Z	500	50	25,000	83·33

(ii) *On the basis of average unit cost*

Joint Cost ÷ No. of units = Average Cost.

or Rs. 50,000 ÷ 1,500 = Rs. 33·333

Products	No. of units	Unit cost Rs.	Apportioned cost Rs.
X	700	33·333	23,333
Y	500	33·333	16,667
Z	300	33·333	10,000
	1,500	Joint Cost	50,000

(d) *Technical evaluation or survey basis*

Under this method the joint cost of the joint products are apportioned after taking into consideration a number of factors like quantity of materials used, labour operations involved, time consumed, technicalities involved etc.

For each factor a point value is assigned. Each product gets point values on the basis of the factors. The joint cost is apportioned in the ratio of production units × point value. So the method is also known as 'point value method'. The following illustration will explain.

Illustration.

In a process there are three joint products X, Y and Z of which the point values awarded are 3, 4 and 5 respectively. The outputs of the products are X—500, Y—700 and Z—340. The costs upto split-off point amount to Rs. 36,000. Apportion the cost to products X, Y and Z.

Solution :

1 Products	2 Output	3 Points assigned	4 Equivalent units col. (2×3)	5 Ratio	6 Apportioned Cost Rs,
X	500	3	1,500	$\frac{15}{60}$	9,000
Y	700	4	2,800	$\frac{28}{60}$	16,800
Z	340	5	1,700	$\frac{17}{60}$	10,200
			6,000		36,000

(e) *Standard cost basis*

Raw material cost of joint products is suitably apportioned on this basis. So, this has limited application. From the estimated selling price, the profit margin, the selling and distribution expense and conversion costs are deducted to ascertain the material cost. The method can be used for ascertaining the maximum price payable for material purchase. The following illustration will explain.

Illustration.

A process factory uses 100 kgs. of a particular material per batch of production. Three joint products are obtained from the process. Production and selling price are estimated as below :

Product	Production per 100 kgs. of the material	Selling price
A	40 kgs.	Rs. 20 per kg.
B	30 kgs.	Rs. 30 per kg.
C	200 litres	Rs. 10 per litre

Selling and Distribution expenses are estimated at Rs. 800, Labour and Overhead per batch are estimated at Rs. 1,058, Material handling cost is estimated at Rs. 100 per 100 kg. 2% of the materials at original cost (excluding handling cost) is retrieved at the end of each process and is used in the next batch of production. The balance of raw materials, not accounted for, may be taken as invisible waste.

The factory expects a profit of 10% on sales.

Ascertain the purchase price of material that can be allowed, at the maximum, for each product.

Solution :

Total Sales :	Rs.
A— 40 × Rs. 20	800
B— 30 × Rs. 30	900
C—200 × Rs. 10	2,000
	3,700
Less : Profit @ 10% on sales	370
Cost of sales	3,330
Less : Selling and distribution expenses	800
Factory cost	2,530
Less : Labour and overhead	1,058
	1,472
Less : Material handling expenses	100
Material cost	1,372

for (100 *less* 2% i.e., 98 kg.)

Purchase price of material per kg. = Rs. 1,372 ÷ 98 or Rs. 14.

Apportionment of Joint Cost of Sales

1 Product	*2* Production	*3* Selling price	*4* Total Selling price	*5* Cost ($\frac{90}{100} \times$ SP)	*6* Cost per unit (5 ÷ 2)
		Rs.	Rs.	Rs.	Rs.
A	40 kg.	20	800	720	18·00
B	30 kg.	30	900	810	27·00
C	200 litres	10	2,000	1,800	9·00
			3,700	3,330	

(f) *Marginal cost and contribution basis*

Under this method the joint cost is analysed into *fixed cost* and *variable cost i.e., marginal cost.* The marginal cost of the process is apportioned to the joint products on the basis of production units or other physical units and the fixed cost is apportioned on the basis of the marginal contribution by each of the joint products. The following illustration will explain.

Illustration.

Mohan Ltd. obtains three joint products *X*, *Y* and *Z* from a process of manufacture. From the following particulars apportion the joint costs to *X*, *Y* and *Z* on the basis of marginal cost and contribution and also ascertain profit or loss.

Products	Units produced	Selling price Rs.	Cost per unit after separation Rs.
X	400	67	20
Y	400	77	25
Z	200	90	28

	Rs.		Rs.
Joint Cost of material	15,000	Variable overhead	10,000
„ „ „ labour	12,000	Fixed overhead	7,500

Solution :

Total variable costs at split-off point

= Rs. (15,000+12,000+10,000) or Rs. 37,000.

Total output = 1,000 units   ∴ Variable cost per unit = Rs. 37.

Statement

1	2	3	4	5	6
Product	Per unit variable cost at split-off point	Per unit cost after separation	Marginal cost col. (2+3)	Selling price	Contribution col. (5—4)
	Rs.	Rs.	Rs.	Rs.	Rs.
X	37	20	57	67	10
Y	37	25	62	77	15
Z	37	28	65	90	25

Total Contribution—X—400 × Rs. 10 = Rs. 4,000
Y—400 × Rs. 15 = Rs. 6,000   Ratio 4 : 6 : 5.
Z—200 × Rs. 25 = Rs. 5,000
Rs. 15,000

Fixed overhead should be apportioned as below—

$$X—\tfrac{4}{15} × Rs. 7,500 = Rs. 2,000$$
$$Y—\tfrac{6}{15} × Rs. 7,500 = Rs. 3,000$$
$$Z—\tfrac{5}{15} × Rs. 7,500 = Rs. 2,500$$
Rs. 7,500

Profit (Total contribution—Fixed overhead)

X—Rs. (4,000 – 2,000) = Rs. 2,000
Y—Rs. (6,000 – 3,000) = Rs. 3,000
Z—Rs. (5,000 – 2,500) = Rs. 2,500
Rs 7,500

WORKED-OUT PROBLEMS
Re : Simple Process Accounts

Problem 1.

An article passes through three processes of manufacture. From the following details, show the cost of each of the three processes and the cost per article produced during the month of January, 1990 :

	Process No. 1	Process No. 2	Process No. 3
Materials used	75,000	27,000	9,000
Labour	45,000	90,000	30,000
Direct expenses	12,000	36,000	12,600

The indirect expenses amounted to Rs. 42,900 and may be apportioned on the basis of wages. No account need be taken of stocks in hand and work-in-progress at the beginning and at the end of the month. The number of articles produced during the month was 1,200. (*C. U., B. Com. Pass '87*)

Solution :

Process No. 1 Account

Dr. Production : 1,200 units   Period : January, '90 *Cr.*

	Per Unit	Total		Per Unit	Total
	Rs.	Rs.		Rs.	Rs.
To Materials	62·50	75,000	By Transfer to Process		
,, Labour	37·50	45,000	No. 2	119·75	1,43,700
,, Direct expenses	10·00	12,000			
,, Indirect expenses	9·75	11,700			
	119·75	1,43,700		119·75	1,43,700

Process No. 2 Account

Dr. Production : 1,200 units   Period : January, '90 *Cr.*

	Per Unit	Total		Per Unit	Total
	Rs.	Rs.		Rs.	Rs.
To Transfer from Process			By Transfer to Process		
No. 1	119·75	1,43,700	No. 3	266·75	3,20,100
,, Materials	22·50	27,000			
,, Labour	75·00	90,000			
,, Direct expenses	30·00	36,000			
,, Indirect expenses	19·50	23,400			
	266·75	3,20,100		266·75	3,20,100

Process No. 3 Account

Dr. Production : 1,200 units   Period : January, '90 *Cr.*

	Per Unit	Total		Per Unit	Total
	Rs.	Rs.		Rs.	Rs.
To Transfer from Process			By Transfer to Finished		
No. 2	266·75	3,20,100	Stock	316·25	3,79,500
,, Materials	7·50	9,000			
,, Labour	25·00	30,000			
,, Direct expenses	10·50	12,600			
,, Indirect expenses	6·50	7,800			
	316·25	3,79,500		316·25	3,79,500

Working Notes :
   (1) The cost per unit is ascertained by using the formula
$$\frac{\text{Costs incurred during the period}}{\text{Number of units produced during the period}}$$
   (2) Indirect exp. Rs. 42,900 has been apportioned to processes as 3 : 6 : 2.

Problem 2.

The manufacture of a product requires three distinct processes, the product of one process being passed on to the next process and so on to

finished product intact. During the month of July, 1989, the finished product was 1,000 kg. and the following was the expenditure :

	Process A Rs.	Process B Rs.	Process C Rs.
Raw materials	3,000	2,000	1,500
Labour	1,500	3,000	2,000
Direct expenses	500	2,000	3,500

The overhead expenses for the period amounted to Rs. 7,800. These are to be distributed to the processes on the basis of labour charges.

Show the Process Accounts indicating also the unit cost per kg. under each element of cost.

If 10% of the output is estimated to be lost in the course of sale and sampling, what should be the selling price per kg. so as to provide for a gross profit of $33\frac{1}{3}$% on selling price ?

Solution :

Process *A* Account

Dr. Production : 1,000 kg.   Period : July, '89 *Cr.*

	Per kg. Rs.	Total Rs.		Per kg. Rs.	Total Rs.
To Raw materials	3·00	3,000	By Process *B*—transfer	6·80	6,800
„ Labour	1·50	1,500			
„ Direct expenses	0·50	500			
„ Overheads	1·80	1,800			
	6·80	6,800		6·80	6,800

Process *B* Account

Dr. Production : 1,000 kg.   Period : July, '89 *Cr.*

	Per kg. Rs.	Total Rs.		Per kg. Rs.	Total Rs.
To Transfer from Process *A*	6·80	6,800	By Process *C*—transfer	17·40	17,400
„ Raw materials	2·00	2,000			
„ Labour	3·00	3,000			
„ Direct	2·00	2,000			
„ Overheads	3·60	3,600			
	17·40	17,400		17·40	17,400

Process *C* Account

Dr. Production : 1,000 kg.   Period : July, '89 *Cr.*

	Per kg. Rs.	Total Rs.		Per kg. Rs.	Total Rs.
To Transfer from Process *B*	17·40	17,400	By Finished Stock —transfer	26·80	26,800
„ Raw materials	1·50	1,500			
„ Labour	2·00	2,000			
„ Direct expenses	3·50	3,500			
„ Overheads	2·40	2,400			
	26·80	26,800		26·80	26,800

	Rs.
Cost of finished goods	26,800
Add : Profit (33⅓% on sales i.e., 50% on cost)	13,400
Sales	40,200
Gross output	1,000 kg.
Less : Estimated Wastage 10%	100 ,,
Output available for sale	900 ,,

Selling price per kg. $\dfrac{\text{Rs. } 40,200}{900}$ = Rs. 44·67.

Problem 3.

A factory producess a commodity by passing it through three processes. All good production is passed to the next process, when complete, at the cumulative cost to date. The production cycle is short, so stocks held in each process represent unworked material, and it is assumed that both opening and closing stocks are valued at the same cost as materials transferred from the previous process during the month.

The costs for December are :

	Process A	Process B	Process C
	Rs.	Rs.	Rs.
Direct wages	6,000	5,800	4,900
Machinery expenses	3,600	1,400	3,100
Factory overhead	1,700	1,400	800

Other production data are :

	Units	Units	Units
Wastage	1,500	1,000	2,000
Stock, 1st December	—	6,000	8,000
Stock, 31st December	—	3,000	16,000

All waste is absorbed in the cost of good production.

Requisition 132*A* shows that during December the stores passed 59,500 production blanks, to Process *A* at a cost of Re. 0·20 each,

You are required to prepare the Process Accounts, and to show the cost per unit of output at each stage of production.

Solution :

Process *A* Account

Dr.   Period : December, 19......   *Cr.*

	Units	Rs.		Units	Rs.
To Materials	59,500	11,900	By Waste	1,500	—
,, Direct wages		6,000	,, Transfer to Process *B*		
,, Machine expenses		3,600	@ Re. 0·40¹	58,000	23,200
,, Factory overhead		1,700			
	59,500	23,200		59,500	23,200

Working Note :

¹Unit price of good production transferred is Rs. 23,200÷58,000=Re. 0·40.

Process B Account

Dr.   Period : December, 19...... **Cr.**

	Units	Rs.		Units	Rs.
To Opening Stock			By Waste	1,000	
@ Re. 0·40	6,000	2,400	„ Transfer to Process C		
„ Transfer from Process			@ Re. 0·60[1]	60,000	36,000
A @ Re. 0·40	58,000	23,200	„ Closing Stock		
„ Direct wages		5,800	@ Re. 0·40	3,000	1,200
„ Machine expenses		4,400			
„ Factory overhead		1,400			
	64,000	37,200		64,000	37,200

Working Note :

[1]Closing stock is valued at material cost only (Re. 0·40). The good production transferred, therefore, shows cost of Rs. (37,200 − 1,200) + 60,000 or Re. 0·60 per unit.

Process C Account

Dr.   Period : December, 19...... **Cr.**

	Units	Rs.		Units	Rs.
To Opening Stock			By Waste	2,000	
@ Re. 0·60	8,000	4,800	„ Transfer to Finished		
„ Transfer from Process			Stock @ Re. 0·80[1]	50,000	40,000
B @ Re. 0·60	60,000	36,000	Closing stock		
„ Direct wages		4,900	@ Re. 0·60	16,000	9,600
„ Machine expenses		3,100			
„ Factory overhead		800			
	68,000	49,600		68,000	49,600

Working Note :

[1]Cost per unit of finished stock is Rs. (49,600 − 9,600) ÷ 50,000 or Re. 0·80 per unit.

Problem 4.

A chemical factory manufactures a chemical product which passes through three processes. The products of these processes are dealt with as under :

	Process A	Process B	Process C
Transfer to next process	66⅔%	60%	
Transfer to warehouse for sale	33⅓%	40%	100%

In each process 4% of the total weight put in is lost and 6% is scrapped which realises from Process A Rs. 6 per ton, from Process B Rs. 10 per ton and from Process C Rs. 12 per ton.

The following information is available to you for the month of March, 1989 :

Raw materials used :		Process A	Process B	Process C
Tons		1,400	160	1,260
Cost per ton	Rs.	20	Rs. 32	Rs. 14
Manufacturing wages and expenses	Rs.	10,304	Rs. 6,280	Rs. 5,790

You are required to prepare accounts showing cost per ton of each process.

Solution

Process A Account

Dr.   Period : March, 1989   Cr.

	Tons	Rs.		Tons	Rs.
To Materials @ Rs. 20	1,400	28,000	By Loss in weight 4% of 1,400 tons	56	
„ Manufacturing wages and expenses		10,304	„ Sale of scrap 6% of 1,400 tons @ Rs. 6	84	504
			„ Transfer to Process B 66% of 1,260 @ Rs. 30	840	25,200
			„ Transfer to Finished Stock 33% of 1,260 @ Rs. 30	420	12,600
	1,400	38,304		1,400	38,304

Note : Cost per ton : Rs. (38,304 − 504) ÷ (1,400 − 56 − 84) Rs. 30.

Process B Account

Dr.   Period : March, 1989   Cr.

	Tons	Rs.		Tons	Rs.
To Transfer from Process A @ Rs. 30	840	25,200	By Loss in weight 4% of 1,000 tons	40	
„ Materials @ Rs. 32	160	5,120	„ Sale of scrap 6% of 1,000 tons @ Rs. 10	60	600
„ Manufacturing wages and expenses		6,280	„ Transfer to Process C 60% of 900 @ Rs. 40	540	21,600
			„ Transfer to Finished Stock 40% of 900 @ Rs. 40	360	14,400
	1,000	36,600		1,000	36,600

Note : Cost per ton : Rs. (36,600 − 600) ÷ (1,000 − 40 − 60) = Rs. 40.

Process C Account

Dr.   Period : March, 1989   Cr.

	Tons	Rs.		Tons	Rs.
To Transfer from Process B @ Rs. 40	540	21,600	By Loss in weight 4% of 1,800 tons	72	
„ Materials @ Rs. 14	1,260	17,640	„ Sale of scrap 6% of 1,800 tons @ Rs. 12	108	1,296
„ Manufacturing wages and expenses		5,790	„ Transfer to Finished Stock @ Rs. 27 (approx.)	1,620	43,734
	1,800	45,030		1,800	45,030

Note : Cost per ton : Rs. (45,030 − 1,296) ÷ (1,800 − 72 − 108) = Rs. 27 (approx.).

Re : Work-in-Progress and Equivalent Units

Problem 5.

The manufacture of a certain product requires two distinct processes, Process *A* and Process *B*. The following information for a particular costing period applies to Process *A* :

	Rs.
Direct materials	15,000
Direct wages	8,000
Production overhead	7,000

Completed production amounted to 1,700 units, but the following units were only partly complete on the closing date :

400 units 50% complete
400 units 25% complete

Prepare an account for Process *A*.

Solution :

Dr.   **Process *A* Account**   *Cr.*

	Units	Rs.		Units	Rs.
To Direct materials	2,500	15,000	By Transfer to Process B		
,, Direct wages	—	8,000	@ Rs. 15	1,700	25,500
,, Production overhead		7,000	,, Work-in-progress c/d	800	4,500
	2,500	30,000		2,500	30,000
To Work-in-progress b/d	800	4,500			

Working Notes :

1. Input = 1,700 + 400 + 400 or 2,500 units.

2. Equivalent units :

Cost per completed unit : $\dfrac{\text{Cost incurred during the period}}{\text{No. of equivalent units produced during the period}}$

$$= \frac{\text{Rs. } 30,000}{2,000} \text{ or Rs. 15}$$

Value of completed units = Rs. 15 × 1,700 or Rs. 25,500

Value of work-in-progress = Rs. 15 × (200 + 100) or Rs. 4,500.

Problem 6.

The manufacture of a product is carried out in two stages, Process *A* and Process *B*. The following information for March, 1989 applies to Process *A* :

Materials : Rs. 36,000 ; Labour : Rs. 13,600 ; Overhead Rs. 9,900.

During the period, 8,000 units were introduced in the process. At the end of the month, 6,000 units were completed and 2,000 units remained in process. The position of the uncompleted units was as follows :

Materials : 60% ; Labour 40% ; Overhead 30%.

Make out Process *A* Account assuming that there is no opening Work-in-progress and process loss.

Solution :

Dr. Process *A* Account *Cr.*

	Units	Rs.		Units	₹ s.
To Materials	8,000	36,000	By Transfer to Process *B*		
,, Labour	—	13,600	@ Rs. 8·50	6,000	51,000
,, Overhead	—	9,900	,, Work-in-progress c/f	2,000	8,500
	8,000	59,500		8,000	59,500
To Work-in-progress b/d	2,000	8,500			

Workings—

Statement of Equivalent Production

Details	Units	Materials		Labour		Overhead	
		% Completion	Equivalent units	% Completion	Equivalent units	% Completion	Equivalent units
Finished and transferred	6,000	100%	6,000	100%	6,000	100%	6,000
Work-in-progress	2,000	60%	1,200	40%	800	30%	600
Total	8,000		7,200		6,800		6,600

Statement of Cost

Cost Elements		Period cost Rs.	Equivalent units	Cost per unit Rs.
Materials	...	36,000	7,200	5·00
Labour	...	13,600	6,800	2·00
Overhead	...	9,900	6,600	1·50
		59,500		8·50

		Rs.
Valuation of output transferred to Process B :		
6,000 units @ Rs. 8·50		51,000
Value of work-in-progress :		
Materials 1,200 units @ Rs. 5·00	6,000	
Labour 800 units @ Rs. 2·00	1,600	
Overhead 600 units @ Rs. 1·50	900	8,500
		59,500

Problem 7.

A new process has been started and for the first month costs were as follows :

Material (inserted at the start of the process)

A 400 kg. at Rs. 2·50 per kg.

B 3,000 kg. at Re. 0·80 per kg.

Labour—

Supervision Rs. 600

Operators' wages for 2,000 hours at Rs. 3 per hour

Overhead—

Charged at 100% of total labour cost.

During the first month, 3,000 kg. of the product was completed and taken into stock. There was no gain or loss in the process. The work-in-process at the end of the month was taken as 75% complete in relation to labour and overhead, and 100% complete as far as material was concerned.

You are required to prepare the relevant process account for the month, showing : (a) cost of completed product in the month ; (b) value of work-in-process at the end of the month.

Solution :

Dr.   **Process Account**   Cr.

	kg.	Rs.		kg.	Rs.
To Material *A* @ Rs. 2·50	400	1,000	By Transfer to Finished		
,, Material *B* @ Re. 0·80	3,000	2,400	Stock @ Rs. 5	3,000	15,000
,, Supervision		600	,, Work-in-progress c/f	400	1,600
,, Operators' Wages	--	6,000			
,, Overhead	—	6,600			
	3,400	16,600		3,400	16,600

Working Notes :

(1) Equivalent production :

Materials 3,000 + 100% of 400 = 3,400 kg.

Labour and Overhead = 3,000 + 75% of 400 = 3,300 kg.

(2) Cost per kg. of equivalent production :

                                                      Rs.

Materials Rs. 3,400 ÷ 3,400   1·00

Labour and overhead Rs. 13,200 ÷ 3,300   4·00

                                                      5·00

(3) Value of Work-in-progress :

Materials 400 kg. @ Re. 1·00   400

Labour and overhead 300 kg. @ Rs. 4   1,200

                                                 1,600

Problem 8.

The following figures relate to a single industrial process :

Quantity of work-in-process at commencement : 8,000 units

Cost of work-in-process at commencement :

    Material Rs. 29,600

    Wages   Rs. 6,600

    Overhead Rs. 5,800

During the period under review, a further 32,000 units were introduced, and the additional costs were :

Material : Rs. 1,12,400 ; Wages : Rs. 33,400 ; Overhead Rs. 30,200.

At the end of the period, 28,000 units were fully processed and 12,000 units remained in process. This closing stock was complete as regards material cost, and one-third complete as regards wages and overhead.

Using the average method of valuation, tabulate these production and cost figures to give quantities, unit values, and total values for completed output, and for each of the three elements comprising the closing work-in-process.

Solution :

Statement of Equivalent Production

Details	Units	Materials		Wages and overhead	
		% Completion	Equivalent units	% Completion	Equivalent units
Finished and transferred	28,000	100%	28,000	100%	28,000
Closing WIP	12,000	100%	12,000	33⅓%	4,000
	40,000		40,000		32,000

Statement of Cost

Cost element	Opening W.I.P. Rs.	Period cost Rs.	Total cost Rs.	Equivalent units	Cost per unit Rs.
Materials	29.600	1,12,400	1,42,000	40,000	3·550
Wages	6,600	33,400	40,000	32,000	1·250
Overhead	5,800	30,200	36,000	32,000	1·125
	42,000	1,76,000	2,18,000		5·925

		Rs.
Value of completed output : 28.000 units @ Rs. 5·925		1,65,900
Value of closing work-in-progress :		
Materials 12.000 units @ Rs. 3·55	42,600	
Wages 4,000 units @ Rs. 1.25	5,000	
Overhead 4,000 units @ Rs. 1·125	4,500	52,100
		2,18,000

Problem 9.

BD Ltd. make a single product in two successive processes. Cost data for the month of April are :

Process 1 No opening work-in-progress.

1,630 units costing Rs. 2·60 each were introduced.

Labour cost Rs. 2,702, Production Overheads Rs. 1,090.

1,200 completed units passed to Process 2. Closing stock of Process 1 is 380 units, half complete, but with all material charged.

Process 2 No opening work-in-progress.

Labour cost Rs. 1,000, Production overhead Rs. 800, Packing materials Rs. 600.

800 units were passed to the finished goods store.

Closing stock was 360 units, one-third complete.

You are required to write up process accounts, treating all losses as normal waste.

Solution :

<div align="center">

Process 1 Account

</div>

Dr.   Period : April, 19............*Cr.*

	Units	Rs.		Units	Rs.
To Units introduced	1,630	4,238	By Waste (Blg. fig.)	50	–
,, Labour		2,702	,, Transfer to Process 2		
,, Production overhead		1,090	@ Rs. 5·41	1,200	6,492
			,, Work-in-progress c/f	380	1,538
	1,630	8,030		1,630	8,030

Workings—

<div align="center">

Statement of Equivalent Production

</div>

Details	Units	Materials		Labour and Overhead	
		% Completion	Equivalent units	% Completion	Equivalent units
Transfer to Process 2	1,200	100%	1,200	100%	1,200
Waste	50	—	—	—	—
Closing WIP	380	100%	380	50%	190
	1,630		1,580		1,390

<div align="center">

Statement of Cost

</div>

Cost Elements		Period cost Rs.	Equivalent units	Cost per unit Rs.
Materials	...	4,238	1,580	2·68
Labour and Overhead	...	3,792	1,390	2·73
		8,030		5·41

		Rs.
Value of finished goods—		
1,200 units @ Rs. 5·41		6,492
Value of closing work-in-progress—		
Materials 380 units @ Rs. 2·68	1,018	
Labour and overhead 190 units @ Rs. 2·73	520	1,538
		8,030

Process 2 Account

Dr.   Period : April, 19......   *Cr.*

	Units	Rs.		Units	Rs.
To Transfer from Process 1	1,200	6,492	By Waste	40	—
„ Labour		1,000	„ Transfer to Finished		
„ Production overhead		800	Stock @ Rs. 8·30	800	6,640
„ Packing material		600	„ Work-in-progress c/f	360	2,252
	1,200	8,892		1,200	8,892

Workings—

Statement of Equivalent Production

Details	Units	Materials		Labour and Overhead	
		% Completion	Equivalent units	% Completion	Equivalent units
Transfer to Finished Stock	800	100%	800	100%	800
Waste	40	—	-		
Closing WIP	360	100%	360	33⅓%	120
	1,200		1,160		920

Statement of Cost

Elements of Cost		Cost Rs.	Equivalent units	Cost per unit Rs.
Materials	...	6,492	1,160	5·60
Labour and Overhead	...	1,800	920	1·95
Packing Materials	...	600	800	0·75
		8,892		8·30

Notes : 'It has been assumed that packing relates only to completed production.

		Rs.
Value of finished goods—		
800 units @ Rs. 8·30		6,640
Value of closing work-in-progress —		
Materials 360 units @ Rs. 5·60	2,016	
Labour & overhead 120 units @ Rs. 1·95	236	2,252
		8,892

Problem 10.

The manufacture of a product known as 'Zinka' requires the treatment of input units through three distinct processes at each of which refining material is added and labour and overhead costs are incurred.

Work-in-progress at the beginning of April, 1989 consisted of 8,000 input units which had passed through the first process, the cost to that point being Rs. 96,000. During April, 1989, refining material which cost

Rs. 31,594 was put into the process and labour costs amounted to Rs. 23,940. Process overhead is applied at the rate of 40% of process labour.

7,200 units were completed during the month and transferred to Process 3. Of the remainder, the firm's Chief Chemist estimated that in respect of refining material, labour and overhead, half were 75% complete at the end of the month, and the other half, 40% complete.

You are required to write up Process 2 Account for the month, showing clearly the cost to be transferred to Process 3, and the value of the work-in-progress at the end of the period.

Solution :

<p style="text-align:center">Process 2 Account</p>

Dr.   Period : April, 1989   Cr.

	Units	Rs.		Units	Rs.
To Work-in-progress b/f	8 000	96,000	By Transfer to Process 3		
„ Refining material		31,594	@ Rs. 20·50	7,200	1,47,600
„ Wages		23,940	„ Work-in-progress c/f	800	13,510
„ Overhead		9,576			
	8,000	1,61,110		8,000	1,61,110

Working Notes :

(1) Equivalent production –
  re. Refining material, wages and overhead

100% of 7,200	7,200 units	
75% of 400	300 „	
40% of 400	160 „	
	7,660 „	

(2) Cost per unit of equivalent production :   Rs.
  Costs from last period Rs 96,000 ÷ 8,000   12·00
  Refining materials, wages and overhead Rs. 65,110 ÷ 7,660   8·50
                20·50

(3) Value of Work-in-progress—
  Costs from last period (8,000 – 7,200) 800 units @ Rs. 12   9,600
  Refining materials, wages and overhead 460 units @ Rs. 8·50   3,910
                13,510

Problem 11.

From the following details prepare statement of equivalent production, statement of cost and find the value of (i) output transferred, and (ii) closing work-in-progress.

Opening work-in-progress (2,000 units) :	Rs.
Materials (100% complete)	10,500
Labour (60% complete)	4,200
Overhead (60% complete)	2,100

Units introduced into this process 8,000

There are 2,000 units in process and the stage of completion is estimated to be :

Materials 100% ; Labour 50% ; Overhead 50%,

8,000 units are transferred to next process.

The process costs for the period are :	Rs.
Materials	1,40,000
Labour	1,09,200
Overheads	54,600

Solution :

On the basis of average method

Statement of Equivalent Production

Details	Units	Materials % Completion	Materials Equivalent units	Labour and overhead % Completion	Labour and overhead Equivalent units
Finished and transferred	8,000	100	8,000	100%	8,000
Closing work-in-progress	2,000	100	2,000	50%	1,000
Total	10,000		10,000		9,000

Statement of Cost

Cost elements	Opening W.I.P. Rs.	Period cost Rs.	Total cost Rs.	Equivalent units	Cost per unit Rs.
Materials	10,500	1,40,000	1,50,500	10,000	15·05
Labour	4,200	1,09,200	1,13,400	9,000	12·60
Overhead	2,100	54,600	56,700	9,000	6·30
	16,800	3,03,800	3,20,600		33·95

		Rs.
Value of output transferred : 8,000 units @ Rs. 33·95		2,71,600
Value of closing work-in-progress :		
Materials 2,000 units @ Rs. 15·05	30,100	
Labour 1,000 units @ Rs. 12·60	12,600	
Overheads 1,000 units @ Rs. 6·30	6,300	49,000
		3,20,600

On the basis of FIFO method

Statement of Equivalent Production

Details	Units	Materials % Completion	Materials Equivalent units	Labour and overhead % Completion	Labour and overhead Equivalent units
Opening WIP completed	2,000			40%	800
Introduced and completed	6,000	100%	6,000	100%	6,000
Closing WIP	2,000	100%	2,000	50%	1,000
	10,000		8,000		7,800

Statement of Cost

Cost Elements		Period cost Rs.	Equivalent units	Cost per unit Rs.
Materials	...	1,40,000	8,000	17·50
Labour	...	1,09,200	7,800	14·00
Overhead	...	54,600	7,800	7·00
		3,03,800		38·50

Value of output transferred :

	Rs.	Rs.
Opening W.I.P. (2,000 units)—		
Costs from last period (10,500 + 4,200 + 2,100)	16,800	
Additional costs incurred during the period—		
Labour 800 × Rs. 14·00	11,200	
Overhead 800 × Rs. 7·00	5,600	33,600
Units introduced and completed during the period		
(6,000 units) 6,000 × Rs. 38·50		2,31,000
		2,61,600
Value of closing work-in-progress :		
Materials 2,000 × Rs. 17·50	35,000	
Labour 1,000 × Rs. 14·00	14,000	
Overhead 1,000 × Rs. 7·00	7,000	
	56,000	

Problem 12.

A manufacturing company makes a product by two processes and the data below relate to the second process for the month of April.

A work-in-progress balance of 1,200 units brought forward from March was valued, at cost, as follows :

	Rs.
Direct materials, complete	10,800
Direct wages, 60% complete	6,840
Production overhead, 60% complete	7,200

During April 4,000 units were transferred from the first process to the second process at a cost of Rs. 7·50 each, this input being treated as direct material within the second process.

Other costs incurred by the second process were :

	Rs.
Additional direct materials	4,830
Direct wages	32,965
Production overhead	35,538

3,200 completed units were transferred to finished goods store. A loss of 520 units, being normal occurred during the process. The average method of pricing is used.

Work-in-progress at the end of April consisted of 500 completed units awaiting transfer to the finished goods store and a balance of unfinished units which were complete as regards direct material and 50% complete as regards direct wages and production overhead.

You are required :

(a) to prepare for the month of April the account for the second process.

(b) to present a statement for management setting out the :

(i) cost per unit of the finished product, by element of cost and total ;

(ii) cost of production transferred to finished goods ;

(iii) cost of production of completed units awaiting transfer to finished goods ;

(iv) cost of uncompleted units in closing work-in-progress, by elements of cost and in total.

Solution

(a) **Second Process Account**

Dr. *Period : April, 19......* *Cr.*

	Units	Rs.		Units	Rs.
To Balance b/f			By Normal loss	520	—
—work-in-progress b/f	1 '90	24,840	,, Transfer to finished		
,, Transfer from First			goods @ Rs. 29·45	3,200	94,240
Process @ Rs 7·50	4 000	30,000	,, Balance c/f		
,, Materials		4 830	—completed units		
,, Wages		3:,965	@ R·. 29·45	500	14,725
Overhead		3: 538	work-in-progress	980	19,208
	5,200	1 28,173		5,200	1.28,173

Workings :

Statement of Equivalent Production

Details	Units	Materials		Wages and Overhead	
		% Completion	Equivalent units	% Completion	Equivalent units
Completed	3,700	100%	3,700	100%	3,700
Normal loss	520	—	—	—	—
Closing WIP	980	100%	980	50%	490
	5,200		4,680		4,190

Statement of Cost

Cost element	Opening WIP Rs.	Period cost Rs.	Total cost Rs.	Equivalent units	Cost per unit Rs.
Materials	10,800	34.830	45.630	4,680	9·75
Wages	6,840	32,965	39,805	4,190	9·50
Overheads	7,200	35,538	42,738	4,190	10·20
	24.840	1,03,333	1,28.173		29·45

(h) (i) Cost per unit of finished product   Rs.

Direct materials   9·75

Direct wages   9·50

Production overhead   10·20

    29·45

(ii) Cost of production transferred to finished goods

3,200 units @ Rs. 29·45   94,240

(iii) Cost of completed units awaiting transfer

500 units @ Rs. 29·45   14.725

(iv) Cost of uncompleted units in closing WIP

Direct materials 980 units @ Rs. 9·75   9,555

Direct wages 490 units @ Rs. 9·50   4,655

Production overhead 490 units @ Rs. 10·20   4.998

    19.208

Re : Process Losses (Normal and Abnormal)

Problem 13.

A product passes through three processes. The output of each process is treated as the raw material for the next process. The expenses incurred during a period were as follows :

	Process		
	1st.	2nd.	3rd.
	Rs.	Rs.	Rs.
Material	40,000	20,000	10,000
Labour	6,000	4,000	1,000
Manufacturing overhead	10,000	10,000	15,000

10,000 units were issued to 1st. process and after processing, the output of each process is as under :

	Output (units)	Normal Loss
1st. Process	9,750	2%
2nd. ,,	9,400	5%
3rd. ,,	8,000	10%

No stock of material or work-in-progress was left at the end. Prepare process accounts to show the cost of the finished article.

Solution :

Dr. **Process 1 Account** Cr.

	Units	Rs.		Units	Rs.
To Material	10,000	40,000	By Normal Loss (2%)	200	—
.. Labour	—	6,000	.. Balance c/d		
.. Mfg. overhead	—	10,000	@ Rs. 5·714	9,800	56,000
	10,000	56,000		10,000	56,000
To Balance b/d			By Abnormal Loss to		
@ Rs. 5·714	9,800	56,000	Costing P/L A/c		
			@ Rs. 5·714	50	286
			. Transfer to Process 2		
			A/c @ Rs. 5·714	9,750	55,714
	9,800	56,000		9,800	56,000

Dr. **Process 2 Account** Cr.

	Units	Rs.		Units	Rs.
To Transfer from			By Normal Loss (5%)	488	--
Process 1	9,750	55,714	,, Balance c/d		
Materials	--	20,000	@ Rs. 9·686	9,262	89,714
. Labour		4,000			
. Mfg. overhead		10,000			
	9,750	89,714		9,750	89,714
To Balance b/d			By Transfer to Process		
@ Rs. 9·686	9,262	89,714	3 @ Rs. 9·686	9,400	91,050
. Abnormal Gain to					
Costing P/L. A/c					
@ Rs. 9·686	138	1,336			
	9,400	91,050		9,400	91,050

Dr. **Process 3 Account** Cr.

	Units	Rs.		Units	Rs.
To Transfer from			By Normal Loss (10%)	940	--
Process 2	9,400	91,050	,, Balance c/d	8,460	1,17,050
. Material	--	10,000			
,, Labour		1,000			
.. Mfg. overhead		15,000			
	9,400	1,17,050		9,400	1,17,050
. Balance b/d	8,460	1,17,050	By Abnormal Loss to		
			Costing P/L A/c		
			@ Rs. 13·836	460	6,365
			,, Transfer to Finished		
			Stock @ Rs. 13·836	8,000	1,10,685
			$\left[\dfrac{Rs.\ 1,17,050}{8,460} = Rs.\ 13\cdot836 \right]$		
	8,460	1,17,050		8,460	1,17,050

Problem 14.

600 kg. of a material was charged to Process I at the rate of Rs. 4 per kg. The direct labour accounted for Rs. 200 and the other departmental expenses amounted to Rs. 760. The normal loss is 10 per cent of the input and the net production was 500 kg. Assuming that the process scrap is saleable at Rs. 2 per kg., prepare necessary accounts showing the results of the process.

Solution :

Dr. **Process I Account** *Cr.*

	Kg.	Rs.		Kg.	Rs.
To Materials	600	2,400	By Normal Loss @ Rs. 2	60	120
,, Labour	—	200	,, Balance c/d @ Rs. 6	540	3,240
,, Departmental expenses	·	760			
	600	3,360		600	3,360
To Balance b/d @ Rs. 6	540	3,240	By Abnormal Loss @ Rs. 6	40	240
			,, Transfer to Process II @ Rs. 6	500	3,000
	540	3,240		540	3,240

Dr. **Normal Loss Account** *Cr.*

	Kg.	Rs.		Kg.	Rs.
To Process I A/c	60	120	By Scrap sales @ Rs. 2	60	120

Dr. **Abnormal Loss Account** *Cr.*

	Kg.	Rs.		Kg.	Rs.
To Process I A/c	40	240	By Scrap sales @ Rs. 2	40	80
			, Costing Profit & Loss A/c—transfer		160
	40	240		40	240

Problem 15.

The standard processing loss in refining certain basic material into an industrial cleaning compound is 15%, the scrap being saleable for Re. 0·50 per kg. At the beginning of January, 1989, 8,000 kg. of basic material was put into a process, the output of which was 7,000 kg. of cleaning compound. The basic material cost Re. 0·80 per kg., wages of process operators amounted to Rs. 1,200 and overhead applied to the process was Rs. 480.

Prepare the necessary accounts to show the results of the process.

Solution :

Dr. **Process Account** *Cr.*

	Kg.	Rs.		Kg.	Rs.
To Materials @ Re. 0·80	8,000	6,400	By Normal Loss		
., Wages	---	1,200	@ Re. 0·50	1,200	600
.. Overhead	—	480	., Balance c/d @ Rs. 1·10	6,800	7,480
	8,000	8,080		8,000	8,080
To Balance b/d @ Rs. 1·10	6,800	7,480	By Transfer to Finished		
., Abnormal Gain			Stock @ Rs. 1·10	7,000	7,700
@ Rs. 1·10	200	220			
	7,000	7,700		7,000	7,700

Dr. **Normal Loss Account** *Cr.*

	Kg.	Rs.		Kg.	Rs.
To Proce.. A/c	1,200	600	By Abnormal Gain A/c	200	100
			., Scrap Sales @ Re. 0·50	1,000	500
	1,200	600		1,200	600

Dr. **Abnormal Gain Account** *Cr.*

	Kg.	Rs.		Kg.	Rs.
To Normal Loss A/c	200	100	By Process A/c @ Rs. 1·10	200	220
., Costing Profit & Loss					
A/c		120			
	200	220		200	220

Problem 16.

A product passes through two distinct processes *A* and *B* and then to finished stock. The output of *A* passes direct to *B* and that of *B* passes to finished stock. From the following information you are required to prepare the process accounts :

	Process A	*Process B*
Materials consumed	Rs. 12,000	Rs. 6,000
Direct Labour	Rs. 14,000	Rs. 8,000
Manufacturing Expenses	Rs. 4,000	Rs. 4,000
Input in Process *A* (units)	10,000	—
Input in Process *A* (value)	Rs. 10,000	—
Output (units)	9,400	8,300
Normal wastage (percentage of input)	5 per cent	10 per cent
Value of wastage (per 100 units)	Rs. 8	Rs. 10

No opening or closing stock is held in process.

Solution :

Dr. **Process A Account** *Cr.*

	Units	Rs.		Units	Rs.
To Units introduced	10,000	10,000	By Normal Loss @ Rs. 8		
,, Materials	—	12,000	per 100 units	500	40
,, Labour	—	14,000	,, Balance c/d @ Rs. 4·20	9,500	39,960
,, Mfg. Expenses	—	4,000			
	10,000	40,000		10,000	40,000
To Balance b/d @ Rs. 4·20	9,500	39,960	By Abnormal Loss @		
			Rs. 4·20	100	420
			,, Transfer to Process B		
			@ Rs. 4·20	9,400	39,540
	9,500	39,960		9,500	39,960

Dr. **Process B Account** *Cr.*

	Units	Rs.		Units	Rs.
To Transfer from Process A	9,400	39,540	By Normal Loss @ Rs. 10		
,, Materials	..	6,000	per 100 units	940	94
,, Labour	—	8,000	,, Balance c/d @ Rs. 6·79	8,460	57,446
,, Mfg. Expenses		4,000			
	9,400	57,540		9,400	57,540
To Balance b/d @ Rs. 6·79	8,460	57,446	By Abnormal Loss		
			@ Rs. 6·79	160	1,086
			,, Transfer to Finished		
			Stock @ Rs. 6·79	8,300	56,360
	8,460	57,446		8,460	57,446

Problem 17.

The product of a manufacturing concern passes through two processes
A and *B* and then to finished stock. It is ascertained that in each process
normally 5% of the total weight is lost and 10% is scrap which realises
Rs. 80 per ton and Rs. 200 per ton from processes *A* and *B* respectively.

The following are the figures relating to both the processes :

	Process A	Process B
Materials	1,000 tons	70 tons
Cost of materials per ton	Rs. 125	Rs. 200
Wages	Rs. 28,000	Rs. 10,000
Manufacturing expenses	Rs. 8,000	Rs. 5,250
Output	830 tons	780 tons

Prepare Process Accounts showing cost per ton of each process. There
was no stock of work-in-progress in any process.

(C. U., B. Com. Pass—'83)

Solution :

Dr. **Process A Account** Cr.

	Tons	Rs.		Tons	Rs.
To Materials	1,000	1,25,000	By Loss in we'ght	50	—
., Wages		28,000	., Normal Scrap @ Rs. 80	100	8,000
., Mfg. expenses		8,000	., Balance c/d @ 180	850	1,53,000
	1,000	1,61,000		1,000	1,61,000
To Balance b/d @ Rs. 180	850	1,53,000	By Abnormal Loss		
			@ Rs. 180	20	3,600
			., Transfer to Process B		
			@ Rs. 180	830	1,49,400
	850	1,53,000		850	1,53,000

Dr. **Process B Account** Cr.

	Tons	Rs.		Tons	Rs.
To Transfer from Process A	830	1,49,400	By Loss in weight	45	
., Materials	70	14,000	., Normal Scrap		
., Wages	—	10,000	@ Rs. 200	90	18,000
., Mfg. expenses		5,250	. Balance c/d @ Rs. 210	765	1,60,650
	900	1,78,650		900	1,78,650
To Balance b/d @ Rs. 210	765	1,60,650	By Transfer to Finished		
. Abnormal Gain			Stock @ Rs. 210	780	1,63,800
@ Rs. 210	15	3,150			
	780	1,63,800		780	1,63,800

Problem 18.

A product passes through three distinct processes to completion. From past experience, it is ascertained that normal wastage in each process is as under ·

Process	Wastage	Sale value of wastage
I	2%	Re. 0·25 per unit
II	4%	Re. 0·50 per unit
III	2·5%	Re. 0·60 per unit

The expenses were as follows :

	Process I	Process II	Process III
	Rs.	Rs.	Rs.
Materials	10,000	7,000	6,000
Direct Labour	17,000	8,400	7,900
Manufacturing Expenses	3, 00	3,205	3,494
Other Factory Expenses	1.060	1,800	2,100

4,000 units were introduced in Process I at a cost of Rs. 4 per unit.

The output of Process I was 3,850 units, that of Process II was 3,600 units and that of Process III was 3,500 units.

Prepare Process Accounts and also work out the sale price per unit of finished stock so as to realise 25% profit on selling price.

Solution :

Dr.   **Process I Account**   Cr.

	Units	Rs.		Units	Rs.
To Units introduced			By Normal Wastage (2%)		
;@ Rs. 4	4,000	16,000	@ Re. 0·25	80	20
,, Materials	—	10,000	,, Balance c/d @ Rs. 12	3,920	47,040
,, Labour	—	17,000			
,, Mfg. Expenses	- -	3,000			
,, Other Factory Expenses	—	1,060			
	4,000	47,060		4,000	47,060
To Balance b/d @ Rs. 12	3,920	47,040	By Abnormal Wastage		
			@ Rs. 12	70	840
			,, Transfer to Process II		
			@ Rs. 12	3,850	46,200
	3,920	47,040		3,920	47,040

Dr.   **Process II Account**   Cr.

	Units	Rs.		Units	Rs.
To Transfer from Process I	3,850	46,200	By Normal Wastage (4%)		
,, Materials		7,000	@ Re. 0·50	154	77
,, Labour		8,400	,, Balance c/d @ Rs. 18	3,696	66,528
,, Mfg. Expenses		3,205			
,, Other Factory Expenses		1,800			
	3,850	66,605		3,850	66,605
To Balance b/d @ Rs. 18	3,696	66,528	By Abnormal Wastage		
			@ Rs. 18	96	1,728
			,, Transfer to Process III		
			@ Rs. 18	3,600	64,800
	3,696	66,528		3,696	66,528

Dr.   **Process III Account**   Cr.

	Units	Rs.		Units	Rs.
To Transfer from Process II	3,600	64,800	By Normal Wastage (2·5%)		
,, Materials		6,000	@ Re. 0·60	90	54
,, Labour		7,900	,, Balance c/d @ Rs. 24	3,510	84,240
,, Mfg. Expenses		3,494			
,, Other Factory Expenses		2,100			
	3,600	84,294		3,600	84,294
To Balance b/d @ Rs. 24	3,510	84,240	By Abnormal Wastage		
			@ Rs. 24	10	240
			,, Transfer to Finished Stock @ Rs. 24	3,500	84,000
	3,510	84,240		3,510	84,240

	Rs.
Cost per unit	24
Add : Profit @ 25% on selling price i.e., 33⅓% on cost	8
Selling price	32

Problem 19.

A Ltd. produces an item which passes through two processes before it can be sold. In July, 1989, the relevant data were :

Process	*1*	*2*
Raw material input (5,000 units)	Rs. 15,000	—
Material added in process	—	Rs. 4,080
Direct Labour	Rs. 17,050	Rs. 15,840
Direct Expenses	Rs. 11,950	Rs. 9,330
Output (units)	4,500	4,000
Normal loss as a percentage of input	15	10
Scrap value of each lost unit	Rs. 2	Rs. 3

There was no stock at the start or at the end of either process.
You are required to show all the relevant process accounts.

Solution :

Dr. **Process I Account** *Cr.*

	Units	Rs.		Units	Rs.
To Materials	5,000	15,000	By Normal Loss (15%)		
,, Direct Labour		17,050	@ Rs. 2	750	1,500
,, Direct Expenses		11 950	,, Balance c/d @ Rs. 10	4,250	42,500
	5,000	44,000		5,000	44,000
To Balance b/d @ Rs. 10	4 250	42,500	By Transfer to Process II		
,, Abnormal Gain	250	2,500	@ Rs. 10	4,500	45,000
@ Rs. 10					
	4,500	45,000		4,500	45,000

Dr. **Process II Account** *Cr.*

	Units	Rs.		Units	Rs.
To Transfer from Process I	4,500	45,000	By Normal Loss (10%)		
,, Materials		4,080	@ Rs. 3	450	1,350
,, Direct Labour		15,840	,, Balance c/d @ Rs. 18	4,050	72,900
,, Direct Expenses		9,330			
	4,500	74,250		4,500	74,250
To Balance b/d @ Rs. 18	4,050	72,900	By Abnormal Loss		
			@ Rs. 18	50	900
			,, Transfer to Finished		
			Stock @ Rs. 18	4,000	72,000
	4,050	72,900		4,050	72,900

Dr.   **Normal Loss Account**   C

	Units	Rs.		Units	Rs.
To Process I A/c @ Rs. 2	750	1,500	By Scrap Sales @ Rs. 2	500	1,000
,, Process II A/c @ Rs. 3	450	1,350	,, Abnormal Gain A/c		
			@ Rs. 2	250	500
			,, Scrap Sales @ Rs. 3	450	1,350
	1,200	2,850		1,200	2,850

Dr.   **Abnormal Gain Account**   Cr.

	Units	Rs.		Units	Rs.
To Normal Loss A c @ Rs. 2	250	500	By Process I A/c @ Rs. 10	250	2,500
,, Costing Profit & Loss A/c		2,000			
	250	2,500		250	2,500

Dr.   **Abnormal Loss Account**   Cr.

	Units	Rs.		Units	Rs.
To Process II A/c @ Rs. 18	50	900	By Scrap Sales @ Rs. 3	50	150
			,, Costing Profit & Loss A/c		750
	50	900		50	900

Problem 20.

HL Chemicals Ltd. processes a range of products including a detergent "Nirmal", which passes through three processes before completion and transfer to the finished goods warehouse. During October, data relating to this product were as shown below :

	Total Rs.	Process I Rs.	Process II Rs.	Process III Rs.
Basic raw material (10,000 units)	6,000	6,000	—	—
Direct material added in process	23,500	8,500	9,500	5,500
Direct wages	22,000	4,000	6,000	12,000
Direct expenses	3,470	1,200	930	1,340
Production overhead	16,500			
(Production overhead is absorbed as a percentage of direct wages)		Units	Units	Units
Output		9,200	8,700	7,900
Normal loss in process, of input		10%	5%	10%
All loss has a scrap value, per unit, of		Re. 0·20	Re. 0·50	Re. 1·00

There was no stock at start or at end in any process.

You are required to prepare the following accounts ·

    (i) Process I :   (ii) Process II ;   (iii) Process III :

    (iv) Abnormal Loss ;   (v) Abnormal Gain.

Solution :

Process I Account

Dr.   Period : October, 19...... *Cr.*

	Units	Rs.		Units	Rs.
To Basic raw materials	10,000	6,000	By Normal Loss (10%)		
,, Direct materials		8,500	@ Re. 0·20	1,000	200
,, Direct wages		4,000	,, Balance c/d @ Rs. 2·50	9,000	22,500
,, Direct expenses		1,200			
,, Production overhead		3,000			
	10,000	22,700		10,000	22,700
To Balance b/d @ Rs. 2·50	9,000	22,500	By Transfer to Process II		
,, Abnormal Gain			@ Rs. 2·50	9,200	23,000
@ Rs. 2·50	200	500			
	9,200	23,000		9,200	23,000

Process II Account

Dr.   Period : October, 19...... *Cr.*

	Units	Rs.		Units	Rs.
To Transfer from Process I	9,200	23,000	By Normal Loss (5%)		
Direct materials		9,500	@ Re. 0·50	460	230
,, Direct wages		6,000	,, Balance c/d @ Rs. 5	8,740	43,700
,, Direct expenses		930			
,, Production overhead		4,500			
	9,200	43,930		9,200	43,930
To Balance b/d @ Rs. 5	8,740	43,700	By Abnormal Loss @ Rs. 5	40	200
			,, Transfer to Process III		
			@ Rs. 5	8,700	43,500
	8,740	43,700		8,740	43,700

Process III Account

Dr.   Period : October, 19...... *Cr.*

	Units	Rs.		Units	Rs.
To Transfer from Process II	8,700	43,500	By Normal Loss (10%)		
,, Direct materials		5,500	@ Re. 1·00	870	870
,, Direct wages		12,000	,, Balance c/d @ Rs. 9	7,830	70,470
,, Direct expenses		1,340			
,, Production overhead		9,000			
	8,700	71,340		8,700	71,340
To Balance b/d @ Rs. 9	7,830	70,470	By Transfer to Finished		
,, Abnormal Gain			Stock @ Rs. 9	7,900	71,100
@ Rs. 9	70	630			
	7,900	71,100		7,900	71,100

Dr. **Abnormal Loss Account** Cr.

	Units	Rs.		Units	Rs.
To Process II @ Rs. 5	40	200	By Scrap sales @ Re. 0·50	40	20
			,, Costing Profit & Loss A/c		180
	40	200		40	200

Dr. **Abnormal Gain Account** Cr.

	Units	Rs.		Units	Rs.
To Normal Loss			By Process I @ Rs. 2·50	200	500
--Process I @ Re. 0·20	200	40	,, Process III @ Rs. 9	70	630
,, Normal Loss					
--Process III @ Re. 1	70	70			
,, Costing Profit & Loss A/c		1,020			
	270	1,130		270	1,130

> [*Note* 1. Percentage of production overhead on wages $= \dfrac{16,500}{22,000} \times 100$ or 75 %]

Problem 21.

Florica Ltd. produces bulk quantities of toothpaste from two raw materials, *A* and *B*. Material *A* is introduced into Process 1 from which the output goes to Process 2 when material *B* is introduced. During July, 1989 the company purchased 40,000 kg. of material *A* which was introduced into Process 1. The Process 1 production details are as follows :

40,000 kg. of raw material *A* purchased at	60 p. per kg.
Processing cost (excluding labour)	30 hrs. at Rs. 42 per hr.
Labour cost	Rs. 400
General overheads recovered at	125% of labour cost
Standard yield	90% of input
Waste from this process sold at	15 p. per kg.

The actual output from this process was 35,000 kg. which was transferred to Process 2.

The company used the 35,000 kg. from Process 1 together with 15,000 kg. of purchased material *B*. The Process 2 production details and costs are as follows :

15,000 kg. of material *B* purchased at	20 p. per kg.
Processing cost (excluding labour)	20 hrs. at Rs. 30 per hr.
Labour cost	Rs. 200
General overheads recovered at	50% of labour cost
Standard yield	95% of input
Waste from this process sold at	10 p. per kg.

The actual output of Process 2 was 48,000 kg. which was transferred to finished store.

There was an enquiry for a quantity of 850 kg. of specially prepared waste material from Process 1. This material would have to be specially processed and packed incurring the following cost :

| Processing | 9 p. per kg. |
| Packing | 4 p. per kg. |

This specially prepared waste incurs no process loss and could be entirely sold for 32 p. per kg.

(a) Record the information in the process cost accounts, *before the enquiry was received* and show the overall profit or loss transferred to the profit and loss account from the abnormal gains or losses in processing.

(b) Advise management on whether or not they should produce the 850 kg. of specially prepared waste material from Process 1 and the effect on the overall results of the company.

Solution

Process 1 Account

Dr.   Period : July, 1989   *Cr.*

	Kg.	Rs.		Kg.	Rs.
To Material *A* @ 60 p.	40,000	24,000	By Normal waste (10%)		
,, Processing		1,260	@ 15 p.	4,000	600
,, Labour		400	,, Balance c/d	36,000	25,560
,, Overheads		500			
	40,000	26,160		40,000	26,160
To Balance b/d @ 71 p.	36,000	25,560	By Abnormal waste @ 71 p.	1,000	710
			,, Transfer to Process 2 @ 71 p.	35,000	24,850
	36,000	25,560		36,000	25,560

Process 2 Account

Dr.   Period : July, 1989   *Cr.*

	Kg.	Rs.		Kg.	Rs.
To Transfer from Process 1	35,000	24,850	By Normal waste (5%) @ 10 p.	2,500	250
,, Material *B* @ 20 p.	15,000	3,000	,, Balance c/d @ 60 p.	47,500	28,500
,, Processing		600			
,, Labour		200			
,, Overheads		100			
	50,000	28,750		50,000	28,750
To Balance b/d @ 60 p.	47,500	28,500	By Transfer to Finished stock @ 60 p.	48,000	28,800
,, Abnormal Gain @ 60p.	500	300			
	48,000	28,800		48,000	28,800

Cost (Part I)—36

Dr.   **Normal Waste Account**   *Cr.*

	Kg.	Rs.		Kg.	Rs.
To Process 1 A/c @ 15 p.	4,000	600	By Scrap Sales @ 15 p.	4,000	600
„ Process 2 A/c @ 10 p.	2,500	250	„ Abnormal Gain A/c @ 10 p.	500	50
			„ Scrap Sales @ 10 p.	2,000	200
	6,500	850		6,500	850

Dr.   **Abnormal Waste Account**   *Cr.*

	Kg.	Rs.		Kg.	Rs.
To Process 1 A/c @ 71 p.	1,000	710	By Scrap Sales @ 15 p.	1.000	150
			„ Costing Profit & Loss A/c		560
	1,000	710		1,000	710

Dr.   **Abnormal Gain Account**   *Cr.*

	Kg.	Rs.		Kg.	Rs.
To Normal Loss A/c @ 10 p.	500	50	By Process 2 A/c @ 60 p.	500	300
„ Costing Profit & Loss A/c		250			
	500	300		500	300

Overall profit/(loss) from abnormal gains and losses

		Rs.
Process 1		(560)
Process 2		250
	Overall loss	(310)

(*b*) *Additional profit/(loss) from specially prepared waste*

Extra sales revenue per kg. (32 – 15)   17 p.
Less: Additional costs per kg. : Processing 9 p.
                          Packing 4 p.   13 p.
Additional profit per kg.   4 p.
Total additional profit= 850 kg.× 4 p.=Rs. 34.

It is advisable to produce the specially prepared waste, because it increased the overall profit of the company by Rs. 34.

Problem 22.

A concentrated liquid fertilizer is manufactured by passing chemicals through two consecutive processes. Stores record cards for the chemical

ingredients used exclusively by the first process, show the following data for May, 1989 :

Opening stock	4,000 litres	Rs.	10,800
Closing stock	8,000 litres	Rs.	24,200
Receipts into stores	20,000 litres	Rs.	61,000

Other process data for May is tabulated below :

	Process I	Process II
Direct labour	Rs. 4,880	Rs. 6,000
Direct expenses	Rs. 4,270	
Overhead absorption rates	250% of Direct Labour	100% of Direct Labour
Output	8,000 litres	7,500 litres
Opening stock of work-in-progress	Nil	Nil
Closing stock of work-in-progress	5,600 litres	Nil
Normal yield	85% of input	90% of input
Scrap value of Loss	Nil	Nil

In Process I, the closing stock of work-in-progress has just passed through inspection, which is at the stage where materials and conversion costs are 100% and 75% complete respectively. In Process II inspection is the final operation.

You are required to prepare the relevant accounts to show the result of the processes for May, 1989 and present a detailed working paper showing your calculation.

Solution :

Process 1 Account

Dr.   Period : May, '89   Cr.

	Litres	Rs.		Litres	Rs.
To Materials¹	16,000	47,600	By Normal Loss 15%	2,400	—
,, Labour		4,880	,, Transfer to Process II		
,, Direct Expenses		4,270	@ Rs. 5·25²	8,000	42,000
,, Overhead (250% of labour)		12,200	,, Work-in-progress b/d³	5,600	26,950
	16,000	68,950		16,000	68,950

Working Notes :

¹*Materials input to Process I :*

	Litres	Rs.
Opening Stock	4,000	10,800
Add : Receipts	20,000	61,000
	24,000	71,800
Less : Closing Stock	8,000	24,200
	16,000	47,600

²*Cost of output and work-in-progress ·*

To ascertain the above, equivalent production has to be worked out as below and then the cost is to be determined.

Statement of Equivalent Production

Details	Litres	Materials		Conversion cost	
		% Completion	Equivalent units	% Completion	Equivalent units
Transfer to Process II	8,000	100%	8,000	100%	8,000
Normal Loss	2,400	—	—	—	—
Closing W.I.P.	5,600	100%	5,600	75%	4,200
	16,000		13,600		12,200

Statement of Cost

COST ELEMENTS		Period cost Rs.	Equivalent production units	Cost per litres Rs.
Materials	...	47,600	13,600	3·50
Conversion cost	...	21,350	12,200	1·75
		68,950		5·25

		Rs.
Value of finished goods :		
8,000 litres @ Rs. 5·25		42,000
Value of closing work-in-progress		
Materials 5,600 litres @ Rs. 3·50	19,600	
Conversion cost 4,200 litres @ Rs. 1·75	7,350	26,950
		68,950

Dr.   **Process II Account**   Period : May '89   *Cr.*

	Litres	Rs.		Litres	Rs.
To Transfer from Process I @ Rs. 5·25	8,000	42,000	By Normal loss 10%	800	—
,, Labour		6,000	., Balance c/d @ Rs. 7·50	7,200	54,000
,, Overhead (100% of labour)		6,000			
	8,000	54,000		8,000	54,000
To Balance b/d @ Rs. 7·50	7,200	54,000	By Transfer to Finished Stock @ Rs. 7·50	7,500	56,250
,, Abnormal gain transferred to Costing P/L A/c @ Rs. 7·50	300	2,250			
	7,500	56,250		7,500	56,250

Problem 23.

A company within the food industry mixes powdered ingredients in two different processes to produce one product. The output of Process I becomes the input of Process II and the output of Process II is transferred to the packing department.

From the information given below, you are required to open accounts for Process I, Process II, abnormal scrap and packing department and to record the transactions for the week ended 18th June, 1989.

Process I

Input :	Material *A*	6,000 kg. at Re. 1·00 per kg.
	Material *B*	4,000 kg. at Rs. 2·00 per kg.
Mixing labour		430 hours at Rs. 4 per hour
Normal scrap		5% of weight input
Scrap was sold for		Re. 0·32 per kg.
Output was		9,200 kg.

There was no work-in-progress at the beginning or at the end of the work.

Process II

Input :	Material *C*	6,600 kg. at Rs. 2·50 per kg.
	Material *D*	4,200 kg. at Rs. 1·50 per kg.
	Flavouring essence	Rs. 600
Mixing labour		370 hours at Rs. 4 per hour
Normal waste		5% of weight input
Output was		18,000 kg.

There was no work-in-progress at the beginning of the week, but 1,000 kg. were in process at the end of the week and were estimated to be only 50% complete so far as labour and overhead were concerned. Overhead of Rs. 6,400 incurred by the two processes was absorbed on the basis of mixing labour hours.

Within Process I, abnormal scrap arose, because some batches failed to pass through quality control check at the end of each mix. However, no loss in weight occurred and all scrap was sold for cash on the last day of the week. Any resultant balance on the abnormal scrap account was transferred to profit and loss account.

Solution :

Process I Account

Dr.   Period : Week ended 18th June, '89   Cr.

	kg.	Rs.		kg.	Rs.
To Materials	10,000	14,000	By Normal Loss (5%)		
„ Mixing labour		1,720	@ Re. 0·32	500	160
.. Overhead @ Rs. 8 per hour		3,440	„ Balance c/d @ Rs. 2	9,500	19,000
	10,000	19,160		10,000	19,160
To Balance b/d @ Rs. 2	9,500	19,000	By Abnormal Scrap @ Rs. 2	300	600
			,. Transfer to Process II @ Rs. 2	9,200	18,400
	9,500	19,000		9,500	19,000

Process II Account

Dr.   Period : Week ended 18th June, '89   Cr.

	kg.	Rs.		kg.	Rs.
To Transfer from Process I	9,200	18,400	By Normal Loss (5%)	1.000	
„ Materials	10,800	23,400	„ Output to Packing		
„ Mixing labour		1,480	Deptt. @ Rs. 2·44¹	18,000	43,920
„ Overhead		2,960	„ Work-in-progress c/f		
			@ Rs. 2·32	1,000	2,320
	20,000	46,240		20,000	46,240

Workings :

Statement of Equivalent Production

DETAILS	kg.	Materials		Labour and overhead	
		% Completion	Equivalent units	% Completion	Equivalent units
Output to Packing Deptt.	18,000	100%	18,000	100%	18,000
Normal Loss	1,000	—	—	—	—
Closing WIP	1,000	100%	1 000	50%	500
	20,000		19,000		18,500

Statement of Cost

COST ELEMENTS		Period cost Rs.	Equivalent Production	Cost per kg. Rs.
Input from Process plus materials	...	41.800	19,000	2·20
Mixing labour and overhead	...	4,440	18.500	0·24
		46,240		2·44

	Rs.	Rs.
Value of Finished Goods 18,000 kg. @ Rs. 2·44		43,920
Value of closing work-in-progress :		
Input plus materials 1,000 kg. @ Rs. 2·20	2,200	
Labour and overhead 500 kg. @ Re. 0·24	120	2,320
		46,240

∴ Per unit cost of WIP is $\frac{Rs. 2,320}{1,000}$ = Rs. 2·32.

Abnormal Scrap Account

Dr.   Cr.

	kg.	Rs.		kg.	Rs.
To Process I A/c @ Rs. 2	300	600	By Scrap sales @ Re. 0·32	300	96
			„ Costing P/L A/c		504
	300	600		300	600

Dr. **Packing Deptt. Account** *Cr.*

	kg.	Rs.			kg.	Rs.
To Process II A|c	18,000	43,920				

Problem 24.

A manufacturing company provides you with the following information relating to Process II for the month of April, 1989 :

    (a)   Opening work-in-progress   Nil.

    (b)   Units introduced   10,000 units @ Rs. 5 per unit

    (c)   Expenses charged to process :

         Materials Rs. 19,500, Labour Rs. 64,750, Overheads Rs. 32,400

    (d)   Normal loss in process : 1% of input

    (e)   Closing work-in-progress : 350 units

         Degree of completion :

            Material   100%

            Labour and Overheads   50%

    (f)   Finished output   9,500 units

    (g)   Degree of completion of abnormal loss :

            Material   100%

            Labour and Overheads   80%

    (h)   Units scrapped as normal loss were sold at Rs. 2 per unit.

    (i)   All the units of abnormal loss were sold at Rs. 3 per unit.

You are required to prepare (i) Statement of equivalent production, (ii) Statement of cost, (iii) Process II account, (iv) Abnormal loss account.

Solution :

Statement of Equivalent Production

DETAILS	Units	Materials % Completion	Materials Equivalent units	Labour and overhead % Completion	Labour and overhead Equivalent units
Finished and transferred	9,500	100%	9,500	100%	9,500
Normal loss (1% of input)	100	—	—	—	—
Abnormal loss (balg. fig.)	50	100%	50	80	40
Closing WIP	350	100%	350	50%	175
	10,000		9,900		9,715

		Rs.
Cost of Materials :		
Cost of 10,000 units introduced @ Rs. 5		50,000
Add : Materials charged		19,500
Total		69,500
Less : Normal loss realised 100 units @ Rs. 2		200
		69,300

Statement of Cost

COST ELEMENTS	Period cost Rs.	Equivalent units	Cost per units Rs.
Materials	69,300	9,900	7·00
Labour and Overhead	97,150	9,715	10·00
	1,66,450		17·00

		Rs.
Value of Finished goods 9,500 units @ Rs. 17		1,61,500
Value of Abnormal Loss :		
Material : 50 units @ Rs. 7	350	
Labour and overhead : 40 units @ Rs. 10	400	750
Value of closing work-in-progress :		
Materials : 350 units @ Rs. 7	2,450	
Labour and overhead : 175 units @ Rs. 10	1,750	4,200
		1,66,450

Process II Account

Dr.   Period : April, 1989   **Cr.**

	Units	Rs.		Units	Rs.
To Units introduced	10,000	50,000	By Normal Loss @ Rs. 2	100	200
„ Materials		19,500	„ Abnormal Loss	50	750
„ Labour		64,750	„ Transfer to Finished		
„ Overhead		32,400	goods @ Rs. 17	9,500	1,61,500
			„ Work-in-progress c/f	350	4,200
	10,000	1,66,650		10,000	1,66,650

Dr.   **Abnormal Loss Account**   **Cr.**

	Units	Rs.		Units	Rs.
To Process II A/c	50	750	By Scrap sales @ Rs. 3	50	150
			„ Costing P/L A/c		600
	50	750		50	750

Re : Inter-Process Profits

Problem 25.

The following are the details in respect of Process *A* and Process *B* of a processing factory :

	Process A Rs.	Process B Rs.
Materials	40,000	—
Labour	40,000	56,000
Overheads	16,000	40,000

The output of Process *A* is transferred to Process *B* at a price calculated to give a profit of 20% on the transfer price and the output of Process *B* is charged to Finished Stock at a profit of 25% on the transfer price. The Finished Department realised Rs. 4,00,000 for the finished goods received from Process *B*.

You are asked to show Process Accounts and total profits, assuming that there was no opening and closing work-in-progress.

Solution :

Dr.   **Process *A* Account**   *Cr.*

	Rs.		Rs.
To Materials	40,000	To Transfer to Process *B*	1,20,000
,, Labour	40,000		
,, Overheads	16,000		
	96,000		
.. Profit (20% of transfer price, i.e., 25% of cost)	24,000		
	1,20,000		1,20,000

Dr.   **Process *B* Account**   *Cr.*

	Rs.		Rs.
To Transfer from Process *A*	1,20,000	By Transfer to Finished Stock	2,88,000
,, Labour	56,000		
,, Overhead	40,000		
	2,16,000		
,, Profit (25% of transfer price i.e., 33⅓% of cost)	72,000		
	2,88,000		2,88,000

Statement of Total Profit

	Rs.
Profit from Process *A*	24,000
Profit from Process *B*	72,000
Profit on sales (4,00,000 − 2,88,000)	1,12,000
Total Profit	2,08,000

Problem 26.

A product passes through three distinct Processes *X*, *Y* and *Z*. The output of each process is transferred to the next process at a price which contains a profit of 20% on the amount transferred or 25% on the process cost. The output of Process *Z* is transferred to Finished Stock on the same principle.

In January, 1990 the following costs were incurred :

	Process *X* Rs.	Process *Y* Rs.	Process *Z* Rs.
Materials consumed	40,000	60,000	20,000
Labour	50,000	35,000	60,000
Overhead	10,000	4,000	16,000
Closing stock	20,000	39,000	56,000

There were no stocks in hand on 1st January. The closing stocks are valued at prime cost in each process. The stock of finished goods in hand, on 31st January, was Rs. 30,000. The rest were sold for Rs. 3,60,000.

You are required to prepare the process accounts and the finished goods account. Also calculate the amount of reserve that should be made in respect of the stock in hand.

Solution :

Dr.   **Process X Account**   Cr.

	Total Rs.	Cost Rs.	Profit Rs.		Total Rs.	Cost Rs.	Profit Rs.
To Materials	40,000	40,000	—	By Process Y	1,00,000	80,000	20,000
„ Labour	50,000	50,000	—				
	90,000	90,000	—				
Less : Cl. Stock	20,000	20,000	—				
Prime Cost	70,000	70,000	—				
„ Overhead	10,000	10,000	—				
Process Cost	80,000	80,000	—				
„ Profit (25% of cost)	20,000	—	20,000				
	1,00,000	80,000	20,000		1,00,000	80,000	20,000

Dr.   **Process Y Account**   Cr.

	Total Rs.	Cost Rs.	Profit Rs.		Total Rs.	Cost Rs.	Profit Rs.
To Process X	1,00,000	80,000	20,000	By Process Z	2,00,000	1,44,000	56,000
„ Materials	60,000	60,000	—				
„ Labour	35,000	35,000	—				
	1,95,000	1,75,000	20,000				
Less : Cl. Stock	39,000	35,000	4,000				
Prime Cost	1,56,000	1,40,000	16,000				
„ Overheads	4,000	4,000	—				
Process Cost	1,60,000	1,44,000	16,000				
„ Profit (25% of cost)	40,000	—	40,000				
	2,00,000	1,44,000	56,000		2,00,000	1,44,000	56,000

Dr.   **Process Z Account**   Cr.

	Total Rs.	Cost Rs.	Profit Rs.		Total Rs.	Cost Rs.	Profit Rs.
To Process Y	2,00,000	1,44,000	56,000	By Finished Stock A/c	3,00,000	1,95,200	1,04,800
„ Materials	20,000	20,000	—				
„ Labour	60,000	60,000	—				
	2,80,000	2,24,000	56,000				
Less : Cl. Stock	56,000	44,800	11,200				
Prime Cost	2,24,000	1,79,200	44,800				
„ Overhead	16,000	16,000	—				
Process Cost	2,40,000	1,95,200	44,800				
„ Profit (25% of cost)	60,000	—	60,000				
	3,00,000	1,95,200	1,04,800		3,00,000	1,95,200	1,04,800

Dr.			**Finished Stock Account**			Cr.
	Total Rs.	Cost Rs.	Profit Rs.	Total Rs.	Cost Rs.	Profit Rs.
To Process Z	3,00,000	1,95,200	1,04,800	By Sales 3 60,000	1,75,680	1,84,320
Less : Cl. Stock	30 000	19,520	10,480			
	2,70,000	1,75,680	94,320			
,, Profit (Blg. fig.)	90,000	—	90,000			
	3,60,000	1,75,680	1,84,320	3,60,000	1,75,680	1,84,320

Calculation of Reserve for unrealised profit on stock

Process X—Nil   Rs.

Process Y—$\dfrac{\text{Profit}}{\text{Total}} \times$ Closing Stock $= \dfrac{20,000}{1,95,000} \times 39,000 = $ 4,000

Process Z · · $\dfrac{56,000}{2,80,000} \times 56,000$ 11,200

Finished Stock— $\dfrac{1,04,800}{3,00,000} \times 30,000 = $ 10,480

     Total Reserve for unrealised profit   25,680

The amount of unrealised profit may be ascertained. *alternatively* by ascertaining the cost of stock in the following manner :

Process X—No unrealised profit

Process Y—Cost of Stock $= \dfrac{\text{Cost col. total}}{\text{Total col. excluding profit}} \times$ Stock value

     or $\dfrac{\text{Rs. } 1,75,000}{\text{Rs. } 1,95,000} \times$ Rs. 39,000 $=$ Rs. 35,000

   $\therefore$ *Unrealised Profit* · Rs. 39,000—Rs. 35,000 · Rs. 4,000

Process Z—Cost of Stock $\dfrac{\text{Cost col. total}}{\text{Total col. excluding profit}} \times$ Stock value

     or $\dfrac{\text{Rs. } 2,24,000}{\text{Rs. } 2,80,000} \times$ Rs. 56,000 $=$ Rs. 44,800

   $\therefore$ *Unrealised Profit* $=$ Rs. 56,000—Rs. 44,800 $=$ Rs. 11,200

Finished Stock—Cost of Stock $= \dfrac{\text{Cost col. total}}{\text{Total col. excluding profit}} \times$ Stock value

     or $\dfrac{\text{Rs. } 1,95,200}{\text{Rs. } 3,00,000} \times$ Rs. 30,000 $=$ Rs. 19,520

   $\therefore$ *Unrealised Profit* $=$ Rs. 30,000—Rs. 19,520 $=$ Rs. 10,480.

Problem 27.

A certain product passes through two processes before it is complete and transferred to finished stock. The following data relate to January, 1990 :

	Process I	*Process II*	*Finished Stock*
	Rs.	Rs.	Rs.
Opening stock	15,000	18,000	45,000
Direct materials	30,000	31,500	
Direct wages	22,400	22,500	
Factory overheads	21,000	9,000	
Closing stock	7,400	9,000	22,500
Inter-process profit included in opening stock		3,000	16,500

Output of Process I is transferred to Process II at 25% profit on the transfer price. Output of Process II is transferred to finished stock at 20% profit on the transfer price. Stocks in process are valued at prime cost. Finished stock is valued at the price at which it is received from Process II. Sales during the period are Rs. 2,80,000.

Prepare and compute —

(a) Process cost accounts and finished goods account showing the profit element at each stage,

(b) Actual realised profit, and

(c) Stock valuation for Balance Sheet purpose.

Solution :

(a)

Dr.　　　　　　　　　　　**Process I Account**　　　　　　　　　　　Cr.

	Total Rs.	Cost Rs.	Profit Rs.		Total Rs.	Cost Rs.	Profit Rs.
To Opening Stock	15,000	15,000	---	By Transfer to Pro-			
„ Direct Materials	30,000	30,000	—	cess II	1,08,000	81.000	27,000
„ Direct Wages	22,400	22,400	—				
	67,400	67,400	—				
Less : Closing Stock	7,400	7,400	—				
Prime Cost	60,000	60,000	—				
„ Overheads	21,000	21,000	—				
Process Cost	81,000	81,000	—				
„ Profit ($\frac{1}{3}$ of cost)	27,000	—	27,000				
	1,08,000	81,000	27,000		1,08,000	81,000	27,000

Dr.   Process II Account   **Cr.**

	Total Rs.	Cost Rs.	Profit Rs.		Total Rs.	Cost Rs.	Profit Rs.
To Opening Stock	18,000	15,000	3,000	By Transfer to Fini- shed Stock			
,, Transfer from Process I	1.08,000	81,000	27,000				
,, Direct Materials	31,500	31,500	—		2,25,000	1,51,500	73,500
,, Direct Wages	22,500	22,500	—				
	1,80,000	1,50,000	30,000				
Less : Closing Stock[1]	9,000	7,500	1,500				
Prime Cost	1,71,000	1,42,500	28,500				
,, Overheads	9,000	9,000	--				
Process Cost	1,80,000	1,51,500	28,500				
,, Profit ($\frac{1}{4}$ of cost)	45,000	—	45,000				
	2,25,000	1,51.500	73,500		2,25,000	1,51,500	73,500

Dr,   Finished Stock Account   **Cr.**

	Total Rs.	Cost Rs.	Profit Rs.		Total Rs.	Cost Rs.	Profit Rs.
To Opening Stock	45,000	28,500	16,500	By Sales	2,80,000	1,65,000	1,15,000
,, Transfer from Process II	2,25,000	1.51.500	73,500				
	2,70,000	1,80,000	90,000				
Less : Closing Stock	22,500	15,000	7,500				
	2,47,500	1,65,000	82.500				
,, Profit (balg. fig.)	32,500	--	32,500				
	2,80,000	1,65,000	1,15,000		2,80,000	1,65,000	1,15,000

Working Note :

[1]Cost of Closing Stock has been calculated as under--

Process II $\frac{Cost}{Total} \times$ Closing Stock $= \frac{1,50,000}{1,80,000} \times 9,000 =$ Rs. 7,500

Finished Stock $\frac{1,80,000}{2,70,000} \times 22,500 =$ Rs. 15,000

(Since process stocks have been valued at prime cost, cost in the above formula means prime cost i.e.. cost excluding overhead.)

(b) Actual realised Profit

		Rs.
Profit from Process I		27,000
Profit from Process II	45,000	
Add : Reserve for unrealised profit on opening stock (fig. given)	3,000	
	48,000	
Less : Reserve for unrealised profit on closing stock (9,000 — 7,500)	1,500	46,500
Profit from Finished stock	32,500	
Add : Reserve for unrealised profit on opening stock (fig. given)	16,500	
	49,000	
Less : Reserve for unrealised profit on closing stock (22,500 — 15,000)	7,500	41,500
Actual realised Profit		1,15,000

(c) Stock Valuation for Balance Sheet purpose

	Rs.
Process I	7,400
Process II	7,500
Finished stock	15,000
Value of stock at cost	29,900

Re : By-Products and Joint Products

Problem 28.

The manufacture of a certain product is carried out in three stages, Process A, Process B and Process C. The output of Process A becomes the input of Process B and the output of Process B forms the input of Process C which delivers the end-product. The by-products of Process A and B are sold direct from the factory.

From the information given below, you are required to draw up process accounts and by-products recoveries account, assuming that the by-products are valued at estimated market price of Rs. 20 per ton for Process A and Rs. 24 per ton for Process B at the point of above separation.

Process	*A*	*B*	*C*
Materials	1,000 tons	Rs. 1,200	Rs. 800
	@ Rs. 15 per ton		
Wages	Rs. 16,000	Rs. 30,000	Rs. 24,000
Factory overhead (% on wages)	75%	60%	50%
Wastage (of no sale value)	2 tons	3 tons	2 tons
Sale proceeds of by-products	8 tons	5 tons	
produced	@ Rs. 25 per ton	@ Rs. 30 per ton	

Solution :

Dr. **Process A Account** *Cr.*

	Tons	Rs.		Tons	Rs.
To Materials	1,000	15,000	By Wastage	2	
,, Wages		16,000	,, By-products @ Rs. 20	8	160
,, Factory Overhead			,, Transfer to Process B	990	42,840
@ 75% of wages		12,000			
	1,000	43,000		1,000	43,000

Dr. **Process B Account** *Cr.*

	Tons	Rs.		Tons	Rs.
To Transfer from Process A	990	42,840	By Wastage	3	—
,, Materials		1,200	,, By-products @ Rs. 24	5	120
,, Wages		30,000	,, Transfer to Process C	982	91,920
,, Factory overhead					
@ 60% of wages		18,000			
	990	92,040		990	92,040

Dr.   **Process C Account**   Cr.

	Tons	Rs.		Tons	Rs.
To Transfer from Process B	982	91,920	By Wastage	2	—
,, Materials		800	,, Transfer to Finished		
,, Wages		24,000	Stock @ 131·35	980	1,28,720
,, Factory overhead @ 50%. of wages		12,000			
	982	1,28,720		982	1,28,720

Dr.   **By-products Recoveries Account**   Cr.

	Rs.		Rs.
To Transfer from		By Sales—	
Process A	160	A—8 × 25	200
Process B	120	B—5 × 30	150
,, Profit & Loss A/c	70		
	350		350

Problem 29.

The following details are extracted from the costing records of an oil mill for the year ended 31st March, 1990 :

Purchase of 500 tons of copra at Rs. 400 per ton.

	Crushing Rs.	Refining Rs.	Finishing Rs.
Labour	2,500	1,000	1,500
Electricity	600	360	240
Sundry Stores	100	2,000	-
Steam	880	780	590
Factory Expenses	1,320	660	220
Containers	—	—	7,500

300 tons of crude oil were produced, 250 tons of oil were produced by the refining process, and 248 tons of refined oil were finished for delivery.

Copra sacks were sold for Rs. 400. 175 tons of copra residue were sold for Rs. 11,000. Loss in weight in crushing was 25 tons. 45 tons of by-products obtained from Refining Process were valued at Rs. 6,750.

Make out accounts in respect of each process and calculate the cost of the product per ton at the end of each process.

Solution :

Crushing Process Account

Dr.   **Period : March, 1990**   Cr.

	Tons	Rs.		Tons	Rs.
To Copra	500	2,00,000	By Sale of copra sacks		400
,, Labour		2,500	,, Sale of copra residue	175	11,000
,, Electricity		600	,, Loss in crushing	25	—
,, Sundry Stores		100	,, Transfer to Refining		
,, Steam		880	Process- cost of crude		
,, Factory Expenses		1,320	oil @ Rs. 646·67	300	1,94,000.
	500	2,05,400		500	2,05,400

Note : Cost per ton of crude oil : Rs. 1,94,000 + 300 = Rs. 646·67.

Refining Process Account

Dr.   Period : March, 1990   Cr.

	Tons	Rs.		Tons	Rs.
To Crude Oil from			By By-products	45	6,750
Crushing Process	300	1,94,000	,, Loss in Refining	5	—
,, Labour		1,000	,, Transfer to Finishing		
,, Electricity		360	Process—cost of refined		
,, Sundry Stores		2,000	oil @ Rs. 768·20	250	1,92,050
,, Steam		780			
,, Factory Expenses		660			
	300	1,98,800		300	1,98,800

Note : Cost per ton of refined oil : Rs. 1,92,050 ÷ 250 = Rs. 768·20.

Finishing Process Account

Dr.   Period : March, 1990   Cr.

	Tons	Rs.		Tons	Rs.
To Refined oil from			By Loss in finishing	2	
Refining Process	250	1,92,050	,, Transfer to Finished		
,, Labour		1,500	Stock cost of finished		
,, Electricity		240	oil @ Rs. 814·93	248	2,02,100
,, Steam		590			
,, Factory Expenses		220			
,, Containers		7,500			
	250	2,02,100		250	2,02,100

Note : Cost per ton of finished oil : Rs. 2,02,100 ÷ 248 = Rs. 814·93.

Problem 30.

A company manufactures product Q, which yields two by-products R and S. In March, 1990 the amount spent upto the point of separation was Rs. 32,960. Subsequent expenses were :

	Q	R	S
	Rs.	Rs.	Rs.
Materials	480	320	240
Direct wages	640	480	320
Overheads	480	400	440
	1,600	1,200	1,000

Gross sales value of the products Q, R and S were Rs. 24,000, Rs. 16,000 and Rs. 8,000 respectively. It was estimated that the net profit as a percentage of sales in case of R and S would be 25% and 20% respectively.

Ascertain the profit earned on Q.

Solution :

Share of R and S in joint costs :

	Rs.	R Rs.	Rs.	S Rs.
Gross sales value		16,000		8,000
Less : Estimated net profit on sales				
R @ 25%	4,000			
S @ 20%			1,600	
,, Costs after separation				
Materials	320		240	
Direct wages	480		320	
Overheads	400	5,200	440	2,600
Share of joint costs		10,800		5,400

Share of Q in joint costs :

Total joint costs			32,960
Less : Share of R	10,800		
S	5,400		16,200
Share of Q			16,760

Statement showing Profit earned on Q

		Rs.
Share of pre-separation cost as above		16,760
Post-separation costs		
Materials	480	
Direct wages	640	
Overhead	480	1,600
Total cost of Q		18,360
Sales value		24,000
Profit (24,000−18,360)		5,640

Problem 31.

In manufacturing product X, a company processes the incidental waste into two by-products Y and Z. From the following data relating to the products, you are required to prepare a comparative profit and loss statement showing the individual costs and other details. The total costs up to the point of separation were Rs. 2,48,320. The other particulars were :

	X	Y	Z
Sales	Rs. 6,40,000	Rs. 51,200	Rs. 76,800
Costs after separation	Rs. 64,000	Rs. 10,240	Rs. 11,520
Estimated net profit as a percentage on sales		20%	30%
Estimated selling expenses as a percentage on sales	20%	10%	15%

Cost. (Part I)—37

Solution :

Share of by-products Y and Z in joint costs

	By-product Y	By-product Z
	Rs.	Rs.
Sales	51,200	76,800
Less : Estimated net profit (at given % on sales)	10,240	23,040
Cost of sales	40,960	53,760
Less : Estimated selling expenses		
(at given % on sales)	5,120	11,520
Cost of production	35,840	42,240
Less : Expenses after separation	10,240	11,520
Share of joint costs	25,600	30,720

Share of main product X in joint costs :

Total joint costs		2,48,320
Less : Share of Y	25,600	
Z	30,720	56,320
		1,92,000

Comparative Profit and Loss Statement

	Main product X		By-product Y		By-product Z
	Rs.		Rs.		Rs.
Sales	6,40,000		51,200		76,800
Less : Cost of					
production :	Rs.		Rs.	Rs.	
Pre-separation	1,92,000		25,600	30,720	
Post-separation	64,000		10,240	11,520	
		2,56,000	35,840		42,240
Gross profit		3,84,000	15,360		34,560
Selling Expenses		1,28,000	5,120		11,520
Net profit		2,56,000	10,240		23,040

Problem 32.

In the course of manufacture of the main product 'R', by-products 'S' and 'T' also emerge. The joint expenses of manufacture amount to Rs. 1,19,550. All the three products are processed further after separation and sold as per details given below :

	Main product	By-products	
	R	S	T
Sales	Rs. 90,000	60,000	40,000
Costs incurred after separation	Rs. 6,000	5,000	4,000
Profit as percentage on sales (%)	25	20	15

Total fixed selling expenses are 10% of total cost of sales and these are apportioned to the three-products in the ratio of 20 : 40 : 40.

(i) Prepare a statement showing the apportionment of joint costs to the main product and the two by-products.

(ii) If the by-product 'S' is not put to further processing and is sold at the point of separation for which there is a market, at Rs. 58,500 without incurring any selling expenses, would you advise its disposal at this stage ? Show the workings.

Solution :

Statement showing Apportionment of Joint Costs

		Rs.	Rs.	Rs.	Total
Sales		90,000	60,000	40,000	1,90,000
Less :	Profit (at given %)	22,500	12,000	6,000	40,500
	Cost of Sales	67,500	48,000	34,000	1,49,500
Less :	Selling expenses	2,990	5,980	5,980	14,950
	Cost of Production	64,510	42,020	28,020	1,34,550
Less :	Costs after separation	6,000	5,000	4,000	15,000
Share of joint costs		58,510	37,020	24,020	1,19,550

Note : ¹Selling expenses are 10% of Rs. 1,49,500 (total cost of sales) or Rs. 14,950 apportioned to R, S and T in the ratio of 20 · 40 · 40 as required.

Statement showing Comparative Economies of by-product S

		Sale at point of separation	Sale after further Processing
		Rs.	Rs.
	Sales	58,500	60,000
Less	Cost of Production	37,020	42,020
	Profit	21,480	17,980

It is advisable to dispose of the by-product 'S' at the point of separation, because the profit earned (Rs. 21,480) is more than that (Rs. 17,980) in case of sales after further processing. After further processing, improvement in selling price is only Rs. 15,000, but the further processing cost is Rs. 5,000.

Problem 33.

A factory is engaged in the production of a Chemical 'Bomex', and in course of its manufacture, a by-product 'Brusil' is produced, which after further processing has a commercial value. For the month of September, 1989, the following are the summarised cost data :

	Joint expenses	Separate expenses	
		Bomex	Brusil
Materials	Rs. 1,00,000	6,000	4,000
Labour	Rs. 50,000	20,000	18,000
Overhead	Rs. 30,000	10,000	6,000
Sales price per unit	Rs.	98	34
Units produced		2,000	2,000

Show how you would apportion the joint costs of manufacture and prepare accounts to show cost of production per unit of Bomex and Brusil.

Solution :

	Bomex	Brusil
	Bomex	*Brusil*
Costs after separation :	Rs.	Rs.
Materials	6,000	4,000
Labour	20,000	18,000
Overhead	10,000	6,000
	36,000	28,000
Units produced	2,000	2,000
Cost after separation per unit	Rs. 18	Rs. 14
Sale price per unit	Rs. 98	Rs. 34
Less : Cost after separation per unit	18	14
Sales value before separation	80	20

Total sales value before separation :

Bomex : 2,000 × Rs. 80	Rs. 1,60,000	
Brusil : 2,000 × Rs. 20		Rs. 40,000

Hence joint expenses will be shared in the ratio of 1,60,000 : 40,000

or 4 : 1.

Dr.   **Joint Process Account**   **Cr.**

	Units	Rs.		Units	Rs.
To Materials	4,000	1,00,000	By Main product Bomex		
„ Labour		50,000	@ Rs. 72		
„ Overhead		30,000	(⅘ of total cost)	2,000	1,44,000
			„ By-product Brusil		
			@ Rs. 18		
			(⅕ of total cost)	2,000	36,000
	4,000	1,80,000		4,000	1,80,000

Dr.   **Main Product Bomex Account**   **Cr.**

	Units	Rs.		Units	Rs.
To Joint Process @ Rs. 72	2,000	1,44,000	By Transfer to Finished		
„ Materials		6,000	Stock @ Rs. 90	2,000	1,80,000
„ Labour		20,000			
„ Overhead		10,000			
	2,000	1,80,000		2,000	1,80,000

Dr.   **By-product Brusil Account**   **Cr.**

	Units	Rs.		Units	Rs.
To Joint Process @ Rs. 18	2,000	36,000	By Transfer to Finished		
„ Materials		4,000	Stock @ Rs. 32	2,000	64,000
„ Labour		18,000			
„ Overhead		6,000			
	2,000	64,000		2,000	64,000

Problem 34.

In a process line of Samura Manufacturing Co. three joint products are produced. For the month of February the following data were available :

Product	A	B	
Sale price per kg.	Rs. 5	Rs. 10	Rs. 20
Post-separation point costs	Rs. 10,000	Rs. 5,000	Rs. 15,000
Output	2,500 kg.	1,000 kg.	1,500 kg.

Pre-separation point costs amount to Rs. 20,000.

The joint products are manufactured in one common process, after which they are separated and may undergo further individual processing. The pre-separation point costs are apportionable to joint products, according to weight.

You are required :

(i) to prepare a statement showing the estimated profit or loss for each product and in total.

(ii) as an alternative to the costing system used in (i) above, to present a statement which will determine the maximum profit from the production of these joint products.

The sales value of each product at separation point is as follows :
A : Rs. 3 ; *B* : Rs. 4 ; *C* · Rs. 6.

Solution :

(i) Statement of estimated profit or loss

Product	A	B	C	Total
Output	2,500 kg.	1,000 kg.	1,500 kg.	5,000 kg.
	R .	Rs.	Rs.	Rs.
Sale price per kg.	5	10	20	
Sales revenue	12,500	10,000	30,000	52,500
Pre-separation costs (25 : 10 : 15)	10,000	4,000	6,000	20,000
Post-separation costs	10,000	5,000	15,000	30,000
Total cost	20,000	9,000	21,000	50,000
Profit|(loss)	(7,500)	1,000	9,000	2,500

Note : It has been assumed that no output is sold at separation point, but processed further.

(ii) Statement of profit or loss on extra processing

Product	A	B	C	Total
	Rs.	Rs.	Rs.	Rs.
Extra sales revenue per unit '	2	6	14	—
Extra sales revenue	5,000	6,000	21,000	32,000
Post-separation costs	10,000	5,000	15,000	30,000
Profit|(loss)	(5,000)	1,000	6,000	2,000

Loss on Product *A* is Rs. 5,000 on extra processing and Rs. 2,500 if sold out at separation point (i.e., 2,500 × Rs. 3 Pre-separation cost of

Rs. 10,000). *Product B* gains Rs. 1,000 on extra processing and nil if sold out at separation point (*i.e.*, 1,000 × Rs. 4 pre-separation cost of Rs. 4,000). *Product C* gains Rs. 6,000 on extra processing and Rs. 3,000 if sold out at separation point (*i.e.*, 1,500 × Rs. 6 pre-separation cost of Rs. 6,000). Hence only *B* and *C* gain by extra processing.

			Rs.
To maximise Profit :			
Try to sell product *A* at separation point for	: 2,500 kg. @ Rs. 3	7,500
,, ,, sell product *B* after further processing for :	1,000 kg. @ Rs. 10	10,000
,, ,, sell product *C* after further processing for :	1,500 kg. @ Rs. 20	30,000
			47,500

		Rs.	
Less : Costs : Pre-separation		20,000	
Post-separation (Rs. 5,000 *B* + Rs. 15,000 *C*)	20,000	40,000
Profit			7,500

Note :   1. Extra sales revenue per unit = Selling price at point of sale − Selling price at point of Separation.

Problem 35.

Three joint products are produced by passing chemicals through two consecutive processes, output from the first process is transferred into the second process, from which the three joint products are produced and immediately sold.

The previous month's operating data for the process is tabulated below :

	Process 1	*Process 2*
Direct material	Rs. 1,00,000	—
(25,000 kilos at Rs. 4 per kilo)		
Direct Labour	Rs. 62,500	Rs. 69,000
Overheads	Rs. 45,000	Rs. 69,000
Normal Loss	10% of input	Nil
Scrap value of Loss	Rs. 2 per kilo	—
Output 23,000 kilos		
Joint Product *A*	9,000 kilos	
Joint Product *B*	8,000 kilos	
Joint Product *C*	6,000 kilos	

There were no opening or closing stocks in either process and the selling prices of the output from Process 2 were :

Joint Product *A*	Rs. 24 per kilo
Joint Product *B*	Rs. 18 per kilo
Joint Product *C*	Rs. 12 per kilo

Required :

(a) prepare an account for Process 1, together with any loss or gain accounts you consider necessary to record the month's activities.

(b) Calculate the profit attributable to each of the joint products by apportioning the total costs from Process 2 :

(i) according to weight of output

(ii) by the market value of production

Solution :

(a)

Dr. Process 1 Account *Cr.*

	Kg.	Rs.		Kg.	Rs.
To Material @ Rs. 4	25,000	1,00,000	By Normal Loss @ Rs. 2	2,500	5,000
,, Wages		62,500	,. Balance c/d @ Rs. 9	22,500	2,02,500
,, Overheads		45,000			
	25,000	2,07,500		25,000	2,07,500
To Balance b/d @ Rs. 9	22,500	2,02,500	By Transfer to Process 2		
,, Abnormal gain			@ Rs. 9	23,000	2,07,000
@ Rs. 9	500	4,500			
	23,000	2,07,000		23,000	2,07,000

Dr. Normal Loss Account *Cr.*

	Kg.	Rs.		Kg.	Rs.
To Process 1 A/c	2,500	5,000	By Abnormal Gain A/c	500	1,000
			,. Scrap Sales @ Rs. 2	2,000	4,000
	2,500	5,000		2,500	5,000

Dr. Abnormal Gain Account *Cr.*

	Kg.	Rs.		Kg.	Rs.
To Normal Loss A/c			By Process 1 A/c	500	4,500
@ Rs. 2	500	1,000			
,, Costing Profit & Loss					
A/c		3,500			
	500	4,500		500	4,500

(b) Profit attributable to joint products

(i) Apportioning cost on the basis of weight of output

	Rs.
Total cost of the two processes —Process 1	2,07,000
—Process 2	1,38,000
	3,45,000
Weight of production	23,000 kg.

Cost per kg. = Rs. 3,45,000/23,000 = Rs. 15

	A	B	C	Total
Selling price per unit	Rs. 24	Rs. 18	Rs. 12	
Cost per unit	Rs. 15	Rs. 15	Rs. 15	
Profit (loss) per unit	Rs. 9	Rs. 3	(Rs. 3)	
Quantity produced	9,000	8,000	6,000	
Total profit/(loss)	Rs. 81,000	Rs. 24,000	(Rs. 18,000)	Rs. 87,000

(ii) *Apportioning costs on the basis of market value of production*

	A	B	C	Total
	Rs.	Rs.	Rs.	
Sale value of production	2,16,000	1,44,000	72,000	4,32,000
Costs (in the ratio of 216 : 144 : 72)[1]	1,72,500	1,15,000	57,500	3,45,000
Total profit/(loss)	43,500	29,000	14,500	87,000

Note : 1. Selling price × Output gives the ratio of 216 : 144 : 72.

Problem 36.

A company manufactures two types of industrial sealant by passing materials through two consecutive processes. The results of operating the two processes during the previous month are shown below :

Process 1

	Rs.	ks.
Cost incurred :		
Materials 7,000 kg. at Re. 0·50 per kg.	3,500	
Labour and overheads	4,340	
Output :		
Transferred to Process 2		6,430
Defective production		570

Process 2

	Rs.	
Cost incurred :		
Labour and overheads	12,129	
Output :		
Type *A* sealant		2,000
Type *B* sealant		4,000
By-product		430

It is considered normal that, 10% of the total output from Process 1 may be defective and all defective output is sold as scrap at Re. 0·40 per kg. Losses are not expected in Process 2.

There were no work-in-progress at the beginning or at the end of the month and no opening stocks of sealants.

Sales of the month's output from Process 2 :

Type *A* sealant	1,100 kg.
Type *B* sealant	3,200 kg.
By-product	430 kg.

The remainder of the output from Process 2 was in stock at the end of the month.

The selling prices of the products are, Type *A* sealant Rs. 7 per kg. and Type *B* sealant Rs. 2·50 per kg. No additional costs are incurred on either of the two main products after the second process. The by-product is sold for Rs. 1·80 per kg. after being sterilized, at a cost of Re. 0·30 per kg., in a subsequent process. The operating costs of process 2 are reduced by the net income receivable from sales of the by-product.

You are required :

(a) to calculate, for the previous month, the cost of the output transferred from Process 1 to Process 2 and the net cost or saving arising from any abnormal losses or gains in Process 1 :

(b) to calculate the value of the closing stock of each sealant and the profit earned by each sealant during the previous month, using the following methods of apportioning costs to joint products :

(i) according to weight of output,

(ii) according to market value of output,

(c) consider whether apportioning process costs to joint products is useful. Briefly illustrate, with examples, from your answer to (b) above.

Solution :

(a) Cost of output transferred

	Kg.	Rs.
Cost of input :		
Materials	7,000	3,500
Labour and overheads	--	4,340
	7,000	7,840
Less : Normal loss (@ 40 p)	700	280
	6,300	7,560
Cost per Kg. : Rs. 7,560/6,300		Rs. 1·20
Transfer to Process 2 : 6430 Kg. @ Rs. 1·20		Rs. 7,716

	Rs.
Net saving from abnormal gain	
Credit for Abnormal gain : 6,430 Kg.—6,300 Kg.	
or, 130 Kg. @ Rs. 1·20	156
Less : Revenue lost—130 Kg. @ Re. 0·40	52
Net saving	104

(b) Value of closing stock

	Rs.
Joint costs—Process 2	
Cost of input	7,716
Labour and overheads	12,129
	19,845
Less : Net income from by-product	
430 kg. × (Rs. 1·80 — Re. 0·30)	645
	19,200

(i) According to weight of output

	Weight Kg.	Cost Rs.	Unit cost Rs.
Type *A*	2,000	6,400	3·20
Type *B*	4,000	12,800	3·20
	6,000	19,200	

Value of closing stock

			Rs.
Type *A*	900 Kg. @ Rs. 3·20		2,880
Type *B*	800 Kg. @ Rs. 3·20		2,560
			5,440

Profit/(Loss)

Type *A*	1,100 Kg.×(Rs. 7−Rs. 3·20)	4,180
Type *B*	3,200 Kg.×(Rs. 2·50−Rs. 3·20)	(2,240)
		1,940

(ii) According to market value

	Market value	*Cost*	*Unit cost*
	Rs.	Rs,	Rs.
Type *A*	14,000	11,200	5·60
Type *B*	10,000	8,000	2·00
	24,000	19,200	

Value of closing stock

		Rs.
Type *A*	900 Kg. @ Rs. 5·60	5,040
Type *B*	800 Kg. @ Rs. 2·00	1,600
		6,640

Profit/(Loss)

Type *A*	1,100 Kg.×(Rs. 7−Rs. 5·60)	1,540
Type *B*	3,200 Rg.×(Rs. 2·50−Rs. 2)	1,600
		3,140

(c) For the purpose of stock valuation, cost includes all costs incurred in bringing products to their present condition or location. Hence it is necessary to apportion process costs. It should, however, be noted that, the choice of method of apportionment is arbitrary and hence such apportionment serves no other useful purpose. It may even lead to wrong decisions. For example, under the weight of output method, type *B* sealant is sold at a loss, implying that the final product is not worthwhile ; but, in fact, the process as a whole is profitable. Hence, while taking decisions, apportionment of joint costs should be ignored.

Problem 37.

(*a*) A company operates a process which produces three joint products, all in an unrefined condition. The operating results of this process, for October 1989, are shown below :

Output from Process :	Product *A*	1,00,000 kilos
	Product *B*	80,000 kilos
	Product *C*	80,000 kilos

The month's operating costs were Rs. 13,00,000. The closing stocks were 20,000 kilos of *A*, 15,000 kilos of *B* and 5,000 kilos of *C*. The value

of the closing stock is calculated by apportioning cost according to weight of output. There were no opening stocks and the balance of the output was sold to a refining company at the following prices :

Product *A*	Rs. 5 per kilo
Product *B*	Rs. 4 per kilo
Product *C*	Rs. 9 per kilo

Prepare an operating statement showing the relevant trading result for October, 1989.

(b) The management of the company have been considering a proposal to establish their own refining operations. The current market prices of the refined products are :

Product *A*	Rs. 17 per kilo
Product *B*	Rs. 14 per kilo
Product *C*	Rs. 20·50 per kilo

The estimated unit costs of the refining operation are :

Product	*A*	*b*	*C*
	Rs. per kilo	Rs. per kilo	Rs. per kilo
Direct Material	0·50	0·75	2·50
Direct Labour	2·00	3·00	4·00
Variable Overheads	1·50	2·25	5·50

Prime costs would be variable. Fixed overheads, which would be Rs. 7,00,000 monthly, would be direct to the refining operation. Special equipment is required for refining Product *B* and this would be rented at a cost not included in the above figures of Rs. 3,60,000 per month.

It may be assumed that there would be no weight loss in the refining process and that the quantity refined each month would be similar to October's output shown in (a) above.

Prepare a statement which will assist management to evaluate the proposal to commence refining operations. Include any further comments or observations you consider relevant.

Solution :

(a) **Process operating Statement for October, 1989**

		Rs.	Rs.
Sales :	Product *A* 80,000 Kg. × Rs. 5	4,00,000	
	Product *B* 65,000 Kg. × Rs. 4	2,60,000	
	Product *C* 75,000 Kg. × Rs. 9	6,75,000	13,35,000
Less :	Operating cost	13,00,000	
	Less : Closing stock[1]	2,00,000	11,00,000
	Profit		2,35,000

Working Note :

     ᵃ**Valuation of closing stock :**

$$\text{Cost per kg.} = \frac{\text{total cost}}{\text{total output}} = \frac{\text{Rs. } 13,00,000}{2,60,000} = \text{Rs. } 5$$

Since closing stock totalled 40,000 kg. the value is,

         40,000 × Rs. 5 = Rs. 2,00,000.

(b)   **Evaluation of refining proposal**

Product	A	B	C	Total
	Rs.	Rs.	Rs.	Rs.
Extra sales revenue per kg.	12	10	11·50	
Variable costs per kg.	4	6	12·00	
Contribution per kg.	8	4	(0·50)	
Monthly Production (kg.)	1,00,000	80,000	80,000	
	Rs.	Rs.	Rs.	
Monthly contribution	8,00,000	3,20,000	(40,000)	10,80,000
Less : Specific fixed overhead	—	3,60,000	—	3,60,000
	8,00,000	(40,000)	(40,000)	7,20,000
Less : General fixed overhead				7,00,000
Profit				20,000

Refining of *C* is not at all advisable. *B* should also be sold unrefined unless output can be increased. Refining of *B* will be profitable if the output can be increased by more than 10,000 kg. ; but this perhaps can only be done by increasing the production of all the three products which may cause sales difficulties. If only *A* is refined (and *B* and *C* sold unrefined) the refining process will yield a profit of Rs. (8,00,000 − 7,00,000) of Rs. 1,00,000 per month. The margin of safety is, however, only $12\frac{1}{2}$% of current volume $\left(\dfrac{\text{Rs. } 1,00,000}{\text{Rs. } 8,00,000} \times 100\right)$. Consequently a small reduction in volume may cause the refining project to become unprofitable.

EXERCISES

Theoretical :

1. What is Process Costing ? What are its characteristics ? Name three industries where Process Costing is used.   *(C. U., B. Com. Pass)*

2. Describe the general features of Process Costing. Name three industries where Process Costing can be applied.

3. State the features which distinguish Process Costing from Job Costing.

4. In what types of industries is Process Costing generally applied ? What would influence a Cost Accountant in deciding whether to apply Process or Job Cost System ?

5. Define briefly the following :
       (i) normal loss ;   (ii) abnormal loss ;   (iii) abnormal gain ;
       (iv) scrap ;   (v) waste.

6. Explain normal and abnormal process losses and state how they should be dealt in process cost accounts ?

7. Distinguish between scraps, wastages, spoilages and defectives and indicate how they are treated in cost accounts.

8. What is meant by 'Equivalent Production' ? How it is computed ? Discuss its importance in valuing work-in-progress. Give examples.

9. The following terms are used in the cost department of a company where the operations of the factory are conducted by a continuous flow of materials and units of output from one process to another :

(i) equivalent units ; (ii) normal losses ; (iii) abnormal losses and gains ; (iv) by-products ; (v) joints products.

Define each of these terms and explain how these woul be dealt with in process accounts.

10. Define and explain the terms 'joint-products' and 'by-products'. Enumerate the methods which may be employed in costing joint-products.

11. Distinguish between Joint-product and by-product.

12. Explain how by-products should be dealt with in process costing :

(a) where they are very small in total value ; (b) where they are of substantial value ; and (c) if they need further processing before they can be sold.

Practical :

Re : Simple Process Accounts

1. The manufacture of a product requires three distinct processes, numbered respectively 1, 2 and 3. During August, 1989 the following information was obtained in respect of the product :

	Total Rs.	Process 1 Rs.	Process 2 Rs.	Process 3 Rs.
Direct material	15,200	11,200	2,500	1,500
Direct labour	6,720	1,240	1,720	3,760
Direct expenses	2,000	1,600	400	---
Production overhead	10,080			

There was no stock of raw material or work-in-progress, either at the beginning or at the end of the period.

Production overhead is apportioned to processes on the basis of 150% of direct wages. Production during the period was 1,000 tons.

Prepare Process Cost Accounts showing the cost of the output and the cost per ton at each stage of production.

2. A product passes through two processes, A and B, in turn. From the following information prepare Process Cost Accounts showing the cost of the output of each process and the cost per unit :

	A	B
Material input	Rs. 10.442	Output from A
Process labour and overheads	Rs. 9,300	Rs. 20,960
Units scrapped (and scrap values)	360 @ Rs. 3 each	445 @ Rs. 4 each
Good units produced	2,247	1,802

3. The product of a factory passes through three processes known as A, B and C, the output of each process being passed on to the next process. From the following figures show the cost of each process :

	Process A Rs.	Process B Rs.	Process C Rs.
Materials used	49,000	16,000	7,000
Labour	16,000	25,000	18,000
Overhead	7,000	16,000	12,000
	units	units	units
Production for the month of Jan. '90	36,000	37.500	48,000
Stock (units from preceding process) 1st Jan. '90		4,000	16,500
Stock (units from preceding process) 31st Jan. '90		1,000	5,500

4. A company manufactures and sells three chemicals produced by consecutive processes. In each process 2% of the total weight put in is lost and 10% is scrapped, which from processes 1 and 2 realise Rs. 100 a ton and from process 3 Rs. 20 a ton. The products of the three processes are dealt with as under :

	Process 1	Process 2	Process 3
Sent to warehouse for sale	25%	50%	100%
Passed on to next process	75%	50%	—

The following particulars relate to the month of July, 1989 :

	Process 1	Process 2	Process 3
Raw materials used (tons)	1,000	140	1,348
Cost per ton	Rs. 120	Rs. 200	Rs. 80
Manufacturing wages and expenses	Rs. 30,800	Rs. 25,760	Rs. 18,100

Prepare an account for each process, showing the cost per ton of each product.

5. Abott Ltd. processes a patent material used in building. The material is produced in three consecutive grades, namely, soft, medium and hard. Figures relating to production for the first six months of 1989 are as follows :

	Process 1	Process 2	Process 3
Raw materials used (tons)	1,000	—	—.
Cost per ton	Rs. 200	—	—
Manufacturing wages and expenses	Rs. 87,500	Rs. 39,500	Rs. 10,710
Weight lost (% of input of the process)	5%	10	20%
Scrap (sold at Rs. 50 per ton)	50 tons	30 tons	51 tons
Sale price per ton	Rs. 350	Rs. 500	Rs. 800
Management Expenses were	Rs. 17,500 and selling expenses Rs. 10,000		

Two-thirds of the output of Process 1 and one-half of the output of Process 2 are passed on to the next Process and the balances are sold. The entire output of Process 3 is sold.

Prepare the three process accounts and a statement of profit. Make approximations where necessary.

Re : Work-in-progress and Equivalent units

6. The Banarhat Brewery processes a range of bears including its prize winning "Madira" which passes through the malting, hopping and skimming departments before completion. Details for the hopping department for July, 1989 are as follows :

Quantity transferred from malting department 1,000 litres, cost Rs. 1,250
Quantity transferred to skimming department 600 litres.
Costs added :

Materials	Rs. 2,000
Labour	Rs. 1,260
Overhead	Rs. 570

Closing work-in-progress : Degree of completion :

Materials	50%
Labour	60%
Overhead	40%

There was no opening work-in-progress, and no losses occurred during the month.

You are required to calculate :

(a) The cost of the quantity transferred to skimming department ; and

(b) The value of closing work-in-progress.

Assume no increase or decrease in volume due to addition of materials.

7. A company manufactures a product which involves two consecutive processes viz., pressing and polishing. For the month of July, 1989, the following information is available :

	Pressing	Polishing
Opening stock	Nil	Nil
Input of units in process	2,000	1,600
Units completed	1,500	800
Units under process	500	800
Materials cost	Rs. 1,20,000	Rs. 12,600
Conversion costs	Rs. 3,42,000	Rs. 54,000

For incomplete units in process, charge material costs at 100 per cent and conversion costs at 60 per cent in the Pressing process and 50 per cent in the Polishing process.

Prepare a statement of cost and calculate the selling price per unit which will result in 25 per cent profit on sale price.

8. On 1st July 1989, 1,000 units were transferred from Process *A* to Process *B* at a unit cost of Rs. 2·40. During July, the following costs were incurred in Process *B* :

materials : Rs. 480 ; labour : Rs. 2,024 ; overhead : Rs. 2,484.

On July 31st, 800 units were completed. The position on the uncompleted units was as follows :

materials : 80% complete ; labour : 60% complete ; overhead : 60% complete.

All completed units are transferred to Process *C*. Prepare Process *B* Account.

9. A company operates a department producing a component which passes through two processes. During April, materials for 40,000 components were put into process. There was no opening process stock. 30,000 components were finished and passed to the next process. Those not passed forward were calculated to be one-half finished as regards wages and overhead. The costs incurred were as follows :

		Rs.
Direct material		10,000
Factory overhead		12,000
Direct wages		8,000

Of those passed to the second process, 28,000 were completed and passed to the finished stores. 200 were scrapped, which was not abnormal. 1,800 remained unfinished in process, one-quarter finished as regards wages and overhead. No further process material costs occur, after introduction at the first process, until the end of the second process, when protective packing is applied to the completed components. The process and packaging costs incurred at the end of the second process were :

		Rs.
Direct material		4,000
Factory overhead		4,500
Direct wages		3,500

Prepare a cost analysis statement for April, accounting for total costs incurred, analysed into elements of costs for each process, covering finished and part-finished items.

10. Cosmeton Ltd. has developed a process for the manufacture of after-shave. Materials are added at the beginning of the process and conversion costs are incurred uniformly. Details for the month ended 30th June, 1989 are as follows :

Work-in-progress at 1st June, 1989 : 4,000 litres, 75% complete
Work-in-progress at 30th June, 1989 : 15,000 litres, 60% complete
Materials added in June : 30,000 litres.

	Materials	*Conversion costs*
Value of opening work-in-progress	Rs. 10,800	Rs. 8,500
Costs added in June	Rs. 30,000	Rs. 47,500

You are required to prepare a cost of production report for the process for June, showing :

(a) a quantity schedule ;

(b) costs charged to the process ;

(c) cost of finished goods ;

(d) value of closing work-in-progress.

11. From the following details prepare Process Account using the FIFO method of valuation :

(1)	Opening work-in-progress (1,000 units)		
	Materials (50% complete)	Rs. 2·00 per unit	
	Labour (60% complete)	Re. 1·00	,,
	Overhead (40% complete)	Re. 0·50	,,
	Total	Rs. 3·50	,,
(2)	Completion of work 7,000 units		
(3)	Closing work-in-progress 2,000 units :		
	Materials	60% complete	
	Labour	40% complete	
	Overhead	30% complete	
(4)	Expenses for the period :	Rs.	
	Materials	46,200	
	Labour	21,600	
	Overhead	14,400	
(5)	Process loss	nil	

12. The following figures relate to Process *B* for the week ending 21st March, 1989 :

Opening work-in-progress :		Rs.
3,000 units		
Costs : From Process *A*		39,000
Materials		7,000
Labour and overhead		3,600
		49,600
		Rs.
Units transferred from Process *A* 39,000, cost		5,07,000
Costs added : Materials		2,42,600
Labour and overhead		4,45,200
Closing work-in-progress—2,000 units		
Degree of completion—Materials		80%
Labour and overhead		40%

Unfortunately, Jakaria, the cost accountant, has thrown away details of the degree of completion of opening work-in-progress.

You are required to prepare for the week ending 21st March, 1989, the Process *B* account, assuming no production losses.

13. Plastico Ltd. makes plastic ducks. Details for the month ending 31st December, 1989 are as follows :

Work-in-progress at 1st December, 1987 :		
200 units cost	Rs. 1,250	
Degree of completion	Materials	75%
	Labour	50%
	Overhead	30%

Cost (Part I)—38

Costs added during December :

	Rs.
Materials	10,250
Labour	8,000
Overhead	5,895

Work-in-progress at 31st December, 1989 :

500 units

Degree of completion—Materials	60%
Labour	40%
Overhead	25%

The company completed 1,900 units during December.

You are required to calculate the cost of units completed.

14. Shown below is the previous month's data for Process 3, the final manufacturing operation in the production of standard-sized insulation blocks.

Work-in-progress :

Opening stock 400 blocks, total cost Rs. 2,000

Closing stock 500 blocks.

The degree of completion of both opening and closing stocks of work-in-progress was :

Previous process costs	100%
Process 3 materials	80%
Conversion costs	60%

During the month 4,500 blocks were transferred from Process 2 at a total cost of Rs. 18,000. Other costs charged to Process 3 during the month were :

	Rs.
Materials	8,720
Labour and overhead	4,250

Process inspection occurs when Process 3 materials are 60 per cent complete and conversion costs 30% complete and normally no losses are expected at this stage. However, during the month 300 blocks were rejected at inspection and sold as scrap for Rs. 2 each.

The Company operates the first-in, first-out method of charging opening stock to production. You are required to prepare the Process 3 account and an abnormal loss account recording the data shown above. Include a detailed working paper showing all your calculations.

15. The following information has been extracted from the records of a company engaged in the manufacture of a single product.

Work-in-progress (opening)	16,000 units
Cost : Material	Rs. 1,48,000
Wages	Rs. 33,000
Overhead	Rs. 29,000

During the period the input was 64,000 units.

Additional costs were :

	Rs.
Material	5,62,000
Wages	1,67,000
Overhead	1,51,000

At the end of the period, 56,000 units were fully processed and 24,000 units were in process. The value of the closing stock includes the full cost of materials and only one-third of the cost of wages and overhead.

Tabulate the production and cost figures to give quantities, unit values and total value of completed output and value of each element of cost for closing work-in-progress. Average method of valuation may be used.

16. Product *P* is made by means of three processes. Material is put into process at the start of Process 1 and the output transferred to Process 2. The output of Process 2 is transferred to Process 3 and the completed product of Process 3 is transferred to finished goods stock.

Data for the week ended 31st October, 1989 relating to product *P* are given below :

Process	Units	Stage of Completion	Cost Rs.
Work-in-process, at start	20	50%	270
Input : Material	270		3,240
Labour and overhead			840
Output : Transferred to Process 2	290		
2. Input : Material added			530
Labour and overhead			1,540
Output : Transferred to Process 3	240		
Work-in-process, at end :			
Material added	50	{ 50%	
Labour and overhead		{ 80%	
Work-in-process, at start :	90		
Transferred cost			2,025
Labour and overhead		33⅓%	105
Input : Labour and overhead			1,015
Output : Transferred to finished goods stock	300		
Work-in-process, at end	30	66⅔%	
Finished goods :			
Stock at start	100		2,700
Sold	324		

No units were lost in production and the *weighted average basis* of pricing is to be used.

You are required to prepare for the week ended 31st October, 1989 :

(a) the three manufacturing process accounts, showing in each :
    (i) the unit cost ;
    (ii) the value of work-in-process ; and
    (iii) the cost of production transferred ; and
(b) the finished goods stock account.

17. A manufacturing concern, engaged in mass production, produces standardised electric motors in one of its departments. From the following particulars of a job of 50 motors you are required to value the work-in-process and finished goods :

		Rs.
(a)	Cost incurred as per job card :	
	Direct material	75,000
	Direct labour	20,000
	Overheads	60,000

(b) Selling price per motor Rs. 4,500.

(c) Selling and distribution expenses are at 30% of sale value.

(d) 25 motors are completed and transferred to finished goods.

(e) Completion stage of work-in-progress :

Direct material	100%
Direct labour and overheads	60%

Re : Process Losses (Normal and Abnormal)

18. You have recently been appointed chief cost accountant of Sabina Chemicals Ltd., a company which converts a raw material known as Peema into a finished product, the Roota. For every ten litres of Peema put in, one litre is expected to be spoiled. Spoiled Peema can be sold for Rs. 2 per litre.

During December, 1989, 5,000 litres of Peema were used at a cost of Rs. 3·60 per litre. Labour costs amounted to Rs. 15,000, overheads incurred totalled Rs. 7,200, and incidental costs of processing came to Rs. 5,800. The actual output of Roota was 4,100 litres.

Write up the process account, the normal spoilage account, and the abnormal spoilage account.

19. A certain product passes through three different processes. The output of each process is treated as the raw material for the next process. No work-in-progress was left at the end of the last process. From the following data, prepare the process accounts, and calculate the cost of the finished articles, explaining under each process account, how you have arrived at the cost and wastage connected with that :

	Process A	Process B	Process C
	Rs.	Rs.	Rs.
Materials issued	50,000	25,000	12,500
Labour	7,500	5,000	1,250
Overhead	12,500	12,500	18,750

The units received in the first process were 15,000 and the output of each process is as follows :

	Process A	Process B	Process C
Output (units)	14,000	13,200	11,700
Normal wastage	4%	5%	10%
Actual wastage	1,000	800	1,500

20. NKG Ltd. produces an item which passes through two processes before it can be sold. In a month, the relevant data were :

Process	1	2
Raw material input (5,000 units)	Rs. 7,500	—
Material added in process	—	Rs. 2,040
Direct Labour	Rs. 8,525	Rs. 7,920
Direct Expenses	Rs. 5,975	Rs. 4,665
Output (units)	4,500	4,000
Normal loss as a percentage of input	15	10
Scrap value of each loss unit	Re. 1	Rs. 1·50

There was no stock at start or at the end of the process.

You are required to show all the relevant process accounts.

21. Product *X* is obtained, after it is processed through three distinct processes. The following cost information is available for a particular period :

	Process A	*Process B*	*Process C*
	Rs.	Rs.	Rs.
Direct Material	6,800	5,650	12,900
Direct Wages	8,000	10,000	12,000

Additional information :

(i) 2,000 units at Rs. 4 each was introduced in Process *A*.

(ii) There was no stock of materials or work-in-progress at the beginning or at the end of the period.

(iii) The production overhead for that period was Rs. 30,000 which may be apportioned on the basis of direct wages.

(iv) The output in units during the period was—Process *A* : 1,900, Process *B* : 1,680, Process *C* : 1,500.

(v) The normal loss was—Process *A* : 5%, Process *B* : 10%, Process *C* 15%.

(vi) The value of scrap per unit was — rocess *A* : Rs. 2, Process *B* : Rs. 5, Process *C* : Rs. 10.

Prepare the Process Accounts indicating Normal Loss, Abnormal Loss and Abnormal Gain.

22. Make out the necessary accounts from the following details :

	Process A	*Process B*
Materials	Rs. 30,000	Rs. 3,000
Labour	Rs. 10,300	Rs. 12,000
Overheads	Rs. 7,000	Rs. 8,600
Input	20,000 units	17,500 units
Normal loss	10%	4%
Sales value of wastes per unit	Re. 1	Rs. 2

There was no opening or closing stock or work-in-progress. Final output from Process *B* was 17,000 units.

23. 'Sufala' is an agricultural fertiliser which is produced by subjecting certain basic materials to chemical processes, the output of Process *A* being transferred to Process *B* from which the fertiliser emerges in sealed

containers. The normal scrap of Process *A* is 25% of input, and of Process *B*, 10% of input, all scraps are sold for 30 p. per kg.

Costs allocated to Batch No. 5213 were :

Process A

Material *X*	40,000 kg. at 40 p. per kg.
Labour	Rs. 516
Overhead	Rs. 1,484
Material *Y*	10,000 kg. at Re. 1 per kg.
Labour	Rs. 256
Overhead	Rs. 1,080

The output from Process *A* was 29,600 kg. and from Process *B* 36,000 kg.

You are required to prepare accounts for each of the two processes and for the scrap.

24. The product of a manufacturing concern passes through three distinct processes to completion. These processes are known as *X*, *Y* and *Z*. Wastage is a normal feature in all the processes and it was found from the past experience that 2%, 5% and 10% of input go as wastage in Process *X*, *Y* and *Z* respectively. In each case the percentage of wastage is computed on the number of units put in the process concerned.

The wastage in each process has a residual value. The wastage of processes *X* and *Y* is sold at Rs. 5 per 100 units and that of Process *Z* at Rs. 20 per 100 units.

The output of each process is transferred immediately to the next process and the finished units are transferred from Process *Z* to Finished Stock Account.

The following particulars are available :

	Process X	Process Y	Process Z
	Rs.	Rs.	Rs.
Materials consumed	6,000	4,000	2,000
Direct Labour	8,000	6,000	3,000
Manufacturing expenses	1,000	1,000	1,000

20,000 units have been issued to Process *X* at a cost of Rs. 10,000. The output of each process has been as follows :

Process *X* 19,500 units, Process *Y* 18,800 units, Process *Z* 16,000 units.

There is no stock or work-in-progress in any process. Prepare the necessary accounts.

25. A product is manufactured after being passed through three separate processes, the output of each process being transferred immediately to the next process, except that the output of Process *C* is transferred to· finished

stock. The normal loss for each process is estimated as : Process *A* 15%, Process *B* 10% and Process *C* 5%. The costs for April, 1990 were :

	Process *A* Rs.	Process *B* Rs.	Process *C* Rs.
Direct material P (50,000 kg.)	52,000	—	—
Q (20,000 kg.)		31,600	—
R (10,000 kg.)	—	—	21,600
Direct wages	2,400	1,400	3,000
Direct expenses	600	696	682

Production overhead, which is absorbed by using the direct wages percentage rate, is Rs. 17,000. The output from Process *A* was 40,500 kg., from Process *B*, 55,500 kg. and from Process *C* 62,200 kg. The following prices can be obtained from scrap sales :

Process *A* Re. 0·20 per kg., Process *B* Re. 0·40 per kg. and Process *C* Re. 0·48 per kg.

You are required to prepare the necessary accounts, ignoring work-in-progress.

26. From the following data relating to product "Zimka", you are required to prepare process cost sheet for each process.

In the second quarter of the year 1989-90 :

Input to Process I	2,000 units @ Rs. 10 each	
Output of Process	in units	normal loss
I	1,840	10%
II	1,740	5%
III	1,600	10%

Scrap realizes Rs. 3, Rs. 5 and Rs. 5 per unit for processes I, II and III respectively.

There was no opening and closing stock of materials or work-in-progress in any process. The output of each process is transferred to the next process and ultimately to the finished stock. Manufacturing overheads are applied to each process @ 50% on direct wages.

Process	Direct Materials Rs.	Direct Labour Rs.	Direct Expenses Rs.
I	4,000	6,000	3,600
II	6,000	4,000	4,100
III	7,170	5,000	4,470

27. A product is obtained, after passing it through three distinct processes. The following information is available for the operations :

	Total Rs.	Process I Rs.	Process II Rs.	Process III Rs.
Materials	5,625	2,600	2,000	1,025
Direct wages	7,330	2,250	3,680	1,400
Production overheads	7,330	—	—	—

500 units @ Rs. 4 per unit were introduced in Process I. Production overhead to be distributed as 100% on Direct Wages.

The actual output and normal loss of the respective processes are :

	Output units	Normal Loss % on input	Value of Scrap per unit
Process I	450	10%	Rs. 2
Process II	340	20%	Rs. 4
Process III	270	25%	Rs. 5

There is no stock or work-in-progress in any process. Show : (a) The three Process Accounts, (b) The Normal Loss Account, (c) The Abnormal Loss Account, and (d) Abnormal Gain Accounts.

28. A product is obtained after it passes through three distinct processes. The following information is obtained for the month of July, 1989 :

	Total Rs.	Process I Rs.	Process II Rs.	Process III Rs.
Direct material	15,084	5,200	3,960	5,924
Direct wages	18,000	4,000	6,000	8,000
Production overheads	18,000			

1,000 units at Rs. 6 each were introduced to Process I. There was no stock of materials or work-in-progress at the beginning or at the end of the period. The output of each process passes direct to the next process and finally to finished stores. Production overhead is recovered on the basis of 100% of direct wages. The following additional data are obtained :

	Process I	Process II	Process III
Output during the month	950	840	750
Percentage of normal loss on input	5%	10%	15%
Value of scrap per unit	Rs. 4	Rs. 8	Rs. 10

Prepare process cost accounts and abnormal gain or loss accounts.

29. A product passes through three processes A, B and C. The normal wastage of each process is as follows :

Process A 3%, Process B 5% and Process C 8%.

Wastage of Process A was sold at Re. 0·50 per unit, that of Process B at Re. 1·00 per unit and that of Process C at Rs. 1·70 per unit.

10,000 units were issued to Process A in the beginning of March, 1990 at a cost of Rs. 5 per unit. The other expenses were as follows :

	Process A Rs.	Process B Rs.	Process C Rs.
Materials	20,000	30,000	10,000
Labour	50,000	70,000	60,000
Direct expenses	10,000	15,800	18,600

Actual output was : Process A 9,500 units, Process B 9,100 units and Process C 8,100 units.

Prepare process accounts assuming that there were no opening or closing stocks. Also give abnormal wastage and abnormal effective accounts.

30. In a factory 4,000 units of raw materials at a cost of Rs. 19,000 were issued to Process *A* during a month. At the end of the month 3,000 units had been produced, 600 units were still in process and 400 units were scrapped. A normal wastage of 5 per cent is allowed.

The work-in-progress is 100 per cent complete as regards raw materials, 75 per cent complete as regards other materials and 50 per cent complete as regards labour and overheads.

The total costs incurred were (in addition to raw materials) as follows :

Other materials	Rs. 3,650
Direct wages	Rs. 7,000
Overheads	Rs. 5,250

Ascertain the cost per unit in regard to (i) raw materials, (ii) other materials, (iii) direct wages, and (iv) overheads.

31. The following information relates to Process *B* for period 3 .

Work-in-progress at start of period—Nil.

Material transferred from Process *A* during the period—2,500 kg. valued at Rs. 7,145.

Wages paid—234½ hours at Rs. 4 per hour.

Other direct costs allocated Rs. 463.

Normal waste during processing—5% of the input to Process *A*. This has a scrap value of 16 p. per kg. and is credited to the Process Account.

At the end of period 3, there were 2,100 kg. transferred to Finished Stock, and 150 kg. remained in Work-in-progress.

The Work-in-progress is 100% completed so far as materials are concerned but only 80% labour and 60% other direct costs are completed.

You are required to construct :

(i) The Process *B* Account showing your workings clearly.

(ii) Any other accounts relevant to the process.

32. The following data relates to Process 1 for July, 1989 of Bebak Ltd. :

Opening work-in-progress	1,500 units at Rs. 15,000
Degree of completion :	
Materials	100%
Labour and overhead	33⅓%
Input of Materials	18,500 units at Rs. 52,000
Direct Labour	Rs. 14,000
Overhead	Rs. 28,000
Closing work-in-progress	5,000 units
Degree of completion :	
Materials	90%
Labour and overheads	30%

Normal process loss is 10% of total input
    (opening work-in-progress units + units put in)

Scrap value Rs. 2 per unit

Units transferred to the next process 15,000 units.

You are required to :

(a) Compute equivalent units of production.

(b) Compute cost per equivalent unit for each cost element, i.e., materials, labour and overheads.

(c) Compute the cost of finished output and closing work-in-progress.

(d) Prepare the process and other accounts.

Assume : (i) Fifo method is used by the company.

(ii) The cost of opening work-in-progress is fully transferred to the next process.

33. A product passes through three processes *A*, *B* and *C*. 10,000 units at a cost of Re. 1 each were issued to Process *A*. The other direct expenses were :

	Process A Rs.	Process B Rs.	Process C Rs.
Sundry materials	1,000	1,500	1,480
Direct labour	5,000	8,000	6.500
Direct expenses	1,050	1,188	1,605

The wastage in Process *A* was 5 per cent and in Process *B* 4 per cent. The wastage of Process *A* was sold at Re. 0·25, that of *B* at Re. 0·50 and that of *C* at Re. 1 per unit. The overhead charges were 168 per cent of direct labour. The final product was sold at Rs. 10 per unit, fetching a profit of 20 per cent on sales. Find the percentage of wastage in Process *C*.

Re : Inter-process profit

34. A product passes through two processes before it is transferred to finished stock. The following information is obtained for the month of December, 1989 :

	Process A Rs.	Process B Rs.	Finished Stock Rs.
Materials	80,000	10,000	—
Labour	20,000	15,000	—
Overhead	10,000	5,000	—
Closing Stock	4,000	8,000	10,000
Sales	—	—	1,20,000

Goods are transferred by Process *A* to Process *B* at 20% profit on transfer price and by Process *B* to Finished Stock Section at 20% profit on cost price.

Prepare Process and Finished Stock Accounts and find out the actual realised profit.

35. Product *A* passes through three processes before it is transferred to finished stock. The following information is obtained for the month of July :

	Process I Rs.	Process II Rs.	Process III Rs.	Finished Stock Rs.
Opening Stock	5,000	8 000	10,000	20,000
Direct Materials	40,000	12,000	15,000	—
Direct Wages	35,000	40,000	35,000	—
Manufacturing Overhead	20,000	24,000	20,000	.
Closing Stock	10,000	4,000	15,000	30,000
Profit as % on transfer price to next process	25%	20%	10%	—
Inter-process profit for opening stock	- -	1,395	2,690	6,534

Stocks in processes are valued at prime cost and finished stock has been valued at the price at which it is received from Process III. Sales during the period were Rs. 4,00,000.

Prepare and compute :---

(a) Process cost accounts showing profit element at each stage,

(b) Actual realised profit, and

(c) Stock valuation for Balance Sheet purpose.

Re : Joint-products and by-products

36. From the following information find out the cost of *A* and *B*, the latter being the by-product by selling which a profit of 20% on selling price is obtained :

	Joint Expenditure	Separate Expenditure A	B
Materials	Rs. 18,000	Rs. 4,000	Rs. 2,000
Labour	Rs. 8,000	Rs. 1,600	Rs. 600
Overheads	Rs. 4,000	Rs. 2,000	Rs. 800

Total amount realised by selling *B* was Rs. 7,000.

37. The following particulars have been obtained about three joint products manufactured from the same raw materials :

	A Rs.	B Rs.	C Rs.
Market price (sale)	50	40	50
Cost of manufacture after the stage at which products are separated	30	15	20

The joint cost of manufacture before the products are separated is Rs. 120. Allocate the joint cost of the products.

38. From the information given below, find out the estimated cost of production of by-products *A* and *B* at the point of separation from the main product :

	A	B
Selling price per unit	Rs. 15	Rs. 30
Cost per unit after separation from main product	Rs. 4	Rs. 6
Units produced	600	400

Selling expenses amount to 25% of total works cost, i.e., including both pre-separation and post-separation works costs.

Selling prices are arrived at by adding a profit of 20% on total cost, (i.e., the sum of works cost and selling expenses).

39. Product 'P' yields two by-products 'Q' and 'R'. The joint expenses of manufacture are : Materials—Rs. 20,000 ; Labour—Rs. 16,000 ; Overhead —Rs. 18,000. Subsequent expenses are as follows :

	P	Q	R
	Rs.	Rs.	Rs.
Materials	4,000	3,200	3,600
Labour	4,800	2,800	3,400
Overhead	5,200	2,000	3,000
	14,000	8,000	10,000
The selling prices are	84,000	40,000	36,000
The estimated profit on sales are	50%	50%	33⅓%

Show how you would apportion the joint expenses of manufacture.

40. A by-product 'Pimpa' is derived in the course of manufacturing a product 'Limpa'. The by-product is further processed for sale. From the following data available from cost records, prepare accounts showing the cost per kg. of both the products.

	Joint Expenses	Separate Expenses	
		Limpa	Pimpa
Materials	Rs. 60,000	Rs. 36,000	Rs. 3,000
Labour	Rs. 42,000	Rs. 30,000	Rs. 12,000
Overheads	Rs. 15,000	Rs. 9,000	Rs. 3,600

The quantities produced during the period under consideration were : Limpa 1,200 kg. and Pimpa 300 kg.

The selling price of Pimpa was Rs. 240 per kg. on which the profit earned was estimated at 30% of the selling price.

41. A factory producing article P also produces a by-product Q which is further processed into finished product. The joint cost of manufacture is given below :

	Rs.
Material	5,000
Labour	3,000
Overheads	2,000
	10,000

Subsequent costs are given below :

	P	Q
	Rs.	Rs.
Material	3,000	1,500
Labour	1,400	1,000
Overheads	600	500
	5,000	3,000

Selling prices are :

P	Rs. 16,000
Q	Rs. 8,000

Estimated profit on selling prices are 25% for *P* and 20% for *Q*. Assume that selling and distribution expenses are in proportion to sales prices. Show how you would apportion joint cost of manufacture and prepare a statement showing cost of production of *P* and *Q*.

42. A company operates a process to produce product *P*, as a result of which process by-products *Q* and *R* are also produced. During a normal period, costs are as follows :

	Rs.
Direct materials	21,000
Direct wages	8,000
Process overheads	12,000

Production was :

Product *P*	500 tons, sold at Rs. 100 per ton
By-product *Q*	70 tons, sold at R . 20 per ton
Cy-product *R*	80 tons, which is unsalable, but it is cleared by a contractor at a charge of Rs. 5 per ton.

The process overheads include Rs. 8,000 of a fixed nature, the balance Rs. 4,000 (50% of direct wages) being regarded as variable.

Both by-products can be further treated, using existing facilities and sold. By the addition of extra materials costing Rs. 600 and direct labour of Rs. 800 to the 70 tons of *Q*, 100 tons of product *S* can be produced and sold at Rs. 40 per ton. By the addition of extra materials costing Rs. 800 and direct labour of Rs. 600 to the 80 tons of *R*, 100 tons of *T* can be produced and sold at Rs. 24 per ton.

Present figures to management and offer advice on the action to be taken.

43. *XY* Ltd. is in the food processing industry and in one of its processes, three joint products are manufactured. Traditionally, the company has apportioned costs incurred up to the joint products pre-separation point on the basis of weight of output of the products.

You have recently been appointed cost accountant, and have been investigating process costs and accounting procedures.

You are required to prepare statements for management to show :

(a) the profit or loss of each product as ascertained using the weight basis of apportioning pre-separation point costs ;

(b) the maximum profit which could be obtained from the manufacture of these products.

The following process data for July are given.
Costs incurred up to separation point Rs. 96,000.

	Product A	Product B	Product C
	Rs.	Rs.	Rs.
Costs incurred after separation point	20,000	12,000	8,000
Selling price per ton :			
Completed product	500	800	600
Estimated, if sold at separation point	250	700	450
	tons	tons	tons
Output	100	60	80

The cost of any unused capacity after the separation point should be ignored.

44. From a joint process, Lokpak Ltd. manufactures four products, known as Pako, Fato, Lako and Zika. Unfortunately, the cost accountant has thrown away some details of the process, and the information that remains is as follows :

	Pako	Fato	Lako	Zika	Total
Units produced	1,000	2,000	3,000	4,000	10,000
	Rs.	Rs.	Rs.	Rs.	Rs.
Joint costs	A	B	1,000	1,250	3,500
Sales value at separation	2,000	C	4,000	D	E
Sales value if processed further	5,000	4,000	F	8,000	G
Additional costs of further processing	H	1,400	1,400	I	7,000
Net sales value if processed further	3,800	2,600	J	K	16,000
Gain or loss from further processing	L	M	N	O	P

Your are required to calculate fifteen missing accounts designated by the letter *A* to *P* in the above total, and to state which products should be sold at separation instead of being processed further.

Joint costs are allocated in proportion to sales value at separation.

Operating Costing is a method of costing applied to ascertain the cost of providing or operating a service. Thus, the field of its application covers the undertakings which do not manufacture any article, but provide or operate services. Transport companies, electricity companies, canteens, hospitals, hotels etc. are the examples of the above undertakings. A manufacturing company may maintain service departments like transport department, power house, canteen, hospital etc. to provide services to the manufacturing, sales and welfare activities of the concern. Operating Costing may be also applied in those service departments to ascertain the unit service cost.

Operating Costing must be clearly distinguished from *Operation Costing* which indicates a technique of costing with a view to ascertaining the total and unit cost of *each operation*. Operation Costing is, therefore, applied in manufacturing undertakings where the final product is obtained after a number of successive operations.

Selection of cost unit, where Operating Costing is applied, requires careful consideration, because cost unit will be different for different types of services. The following are some of the cost units selected for different types of services :

Services	Cost units
1. *Passenger transport service* (Bus, tram, passenger train, air transport etc.)	1. *Passenger-kilometre*
2. *Goods transport service* (lorry, goods train, air transport of goods etc.)	2. *Tonne-kilometre*
3. *Electric supply service*	3. *Kilo-watt hour*
4. *Canteen Service*	4. *Man-meal/cup of tea*
5. *Hospitals*	5. *Patient bed/day*
6. *Private transport* (private car, private aeroplane etc.)	6. *Running hour, trip kilometre*

Costs of the undertakings providing or operating services are to be classified into—

(1) *Operating or running costs* (2) *Maintenance costs and* (3) *Standing costs.*

Operating or running costs are basically *variable costs*, maintenance costs are semi-variable in nature and standing costs, as the name implies, are of fixed nature. Costs should be assembled under the above three classifications. When the maintenance costs can he further classified into

fixed and *variable*, costs may be assembled under two heads only i.e., *fixed costs* and *variable costs.*

To explain the classification of the cost mentioned above, let us take the example of a motor transport company carrying goods.

Motor Transport Company Carrying goods

In case of a motor transport company, operating cost of each vehicle is to be determined and then it should be applied to find out the cost per unit of service rendered by it. The units of cost are chosen according to the needs of the concern and after taking into consideration the weight, bulk, types of goods carried, distance covered by each trip etc. The units commonly in use are—hour of running, a tonne, a kilometre, a tonne-kilometre, a quintal-kilometre etc. Costs are ascertained as cost per running hour, cost of carrying a tonne, cost of running a kilometre, costs of carrying a tonne over a distance of one kilometre, cost of carrying a quintal over a distance of one kilometre respectively. Tonne-kilometre and quintal-kilometre represent the units where both weight of the load and distance have been given due consideration. These units are called *composite units.* The principles applied in the selection of composite units are the consideration of load carried and distance covered. In case of passenger service, distance and number of passengers are to be considered. 15 quintals carried to a distance of 10 kilometres are equivalent to 15×10 or 150 quintal-kilometres. At the same time 75 quintals carried to a distance of 2 kilometres are also equivalent to 150 quintal-kilometres. In these two cases the loading and unloading cost, as well as return distance shall differ widely. Thus, quintal-kilometre or tonne-kilometre do not provide perfect units for cost approtionment, although they may be useful for ascertaining average cost when the load carried and distance covered by each trip do not vary widely. Therefore, *weighted average tonne-kilometre or quintal-kilometre* should be taken as the appropriate cost unit. Let us see how the weighted average tonne-kilometre units are ascertained as below :

Trip I	5 tonnes	× 10 kilometres =	50 tonne-kilometres	
,, II	20 ,,	× 150 ,,	= 3,000 ,,	,,
,, III	35 ,,	× 20 ,,	= 700 ,,	,,
	60	180	3,750	

[The correct tonne-kilometres are 3,750 and not 60×180]

For each vehicle a record is maintained to show the details of trips made daily. This record is called the *Log Book.* The management can make suitable allocation of vehicles for trips, so that duplicate trips, waste or idle running capacity can be avoided. Details of log books also help allocation of costs.

As mentioned earlier, costs are compiled under three distinct heads, namely : (a) Operating or running costs (b) Maintenance costs and (c) Standing (or fixed or stand-by) costs. Let us discuss each briefly.

(a) Operating or running Costs

These costs depend upon the number of trips made and distance covered. So, these are of variable nature. Costs of fuel oil, lubricating oil etc. fall under operating or running costs. If the wages of the driver and cleaner are paid on the basis of number of trips or distance run, such wages also fall under this head, particularly when such driver and cleaner are engaged on specific vehicle. Operating and running costs may be easily allocated to each vehicle.

(b) Maintenance Costs

Costs incurred for maintaining the vehicles are the maintenance costs. Costs of repair, maintenance, tyres, tubes, spares and accessories are the examples of maintenance costs. These costs are of semi-variable nature. Maintenance cost may be capable of being further classified into fixed and variable costs.

(c) Standing Costs

As the name implies, these costs are of fixed nature and do not depend upon the number of trips made or distance run by the vehicle. Licence fees, insurance, road and other taxes, depreciation, head office expenses, cost of workshop, general service charges etc. fall under standing costs. Wages of drivers and cleaners, when they are not attached to specific vehicle or when they are not paid on the basis of trips made or distance run, are also included in standing costs. Some of the fixed costs can be traced with specific vehicles and, in that case, they may be directly allocated to those vehicles. Others are to be suitably apportioned to each vehicle.

The costs for each vehicle are to be analysed under the above-mentioned heads and then compiled periodically in a Cost Sheet or Cost Summary. The Cost Sheet may provide columns for costs of previous period as well as budgeted costs to facilitate comparison.

When the operating costs of each vehicle can be determined for each accounting period, the following advantages can be derived.

Advantages of determining operating costs for each vehicle

The following are the advantages enjoyed :

    (a) Operating and running costs can be controlled.

    (b) Waste of fuel and consumable stores can be reduced.

    (c) Quotation for trips on hire can be easily made.

    (d) Running cost of each vehicle can be compared with that of another vehicle.

    (e) Information can be obtained for efficient routing of vehicles.

    (f) Lost running time and costs of idle vehicle can be easily obtained.

    (g) When transport department is maintained by manufacturing or other concerns, the cost to be charged to any department requisitioning the services of the transport department, can be easily ascertained.

Cost (Part 1)—39

Practical problems worked-out below will illustrate how costs are classified and compiled.

WORKED-OUT PROBLEMS

Problem 1.

Calculate the cost per running kilometre for a motor van from the following particulars :

Kilometreage run (annual)—15,000 ; Cost of motor van--Rs. 60,000

Annual expenses :	Rs.
Road licence	1,200
Insurance	800
Garage rent	600
Supervision expenses	2,800
Driver's monthly wage	Rs. 800
Cost of petrol per litre	Rs. 4
Repairs and maintenance per kilometre	Rs. 1·80
Tyre cost (average) per kilometre	Re. 0·80
Kilometres run per litre of petrol	20
Estimated life of motor van	60,000 kilometres

(C. U., B. Com. Hons.—Adapted)

Solution :

Statement of Operating Cost

Period.

	Amount Rs.	Per km. Rs.
Standing or Fixed Costs :		
Road licence	1,200	
Insurance	800	
Garage rent	600	
Supervision expenses	2,800	
Driver's wage : Rs. 800 × 12	9,600	
For 15,000 kilometres	15,000	1·00
Operating or Variable Costs :		
Cost of petrol : Rs. 4 ÷ 20		0·20
Repairs and maintenance		1·80
Tyre cost		0·80
Depreciation : Rs. 60,000 ÷ 60,000		1·00
Operating cost per kilometre		4·80

Problem 2.

From the following data pertaining to the year 1989-90, prepare a Cost Sheet showing the cost of electricity generated per unit of kwh. by Gauripur Thermal Power Station :

Total units generated	20,00,000 kwh.
Operating labour	Rs. 50,000

Repairs and maintenance   Rs. 50,000
Lubricants, spares and stores   Rs. 40,000
Plant supervision   Rs. 30,000
Administrative overheads   Rs. 20,000

Coal consumed per kwh. for the year is 2·5 kg. @ Re. 0·02 per kg.

Depreciation charge @ 5% on Capital cost of Rs. 2,00,000.

Solution :

Statement of Operating Cost *for the year, 1989-90*

	Amount Rs.	Per kwh. Rs.
Fixed Costs :		
Plant supervision	30,000	
Administrative overheads	20,000	
For 20,00,000 kwh	50,000	0·025
Variable Costs :		
Coal : 2·5 kg. @ Re. 0·02		0·050
Operating labour : Rs. 50,000 ÷ 20,00,000		0·025
Repairs and maintenance : Rs. 50,000 ÷ 20,00,000		0·025
Lubricant and supplies . 40,000 . 20,00,000		0·020
Cost per unit of kwh		0·145

Problem 3.

B. Sen runs a tempo service in the city and has two vehicles. He furnishes to you the following data and wants you to compute the cost per running km.

	Vehicle A Rs.	Vehicle B Rs.
Cost of vehicle	25,000	15,000
Road licence fees per year	750	750
Supervision and salaries (yearly)	1,800	1,200
Driver's wages per hour	4	4
Cost of fuel per litre	1·50	1·50
Repairs and maintenance per km.	1·50	2·00
Tyre cost per km.	1·00	0·80
Garage rent per year	1,600	550
Insurance premium (yearly)	850	500
Kms. run per litre	6	5
Kilometres run during the year	15,000	6,000
Estimated life of vehicles (kilometres)	1,00,000	75,000

Charge interest at 10% p.a. on cost of vehicle. The vehicles run 20 kilometres per hour on an average.

Solution :

Statement of Operating Cost for the period ending......

	Vehicle A	Vehicle B
Fixed expenses per annum :	Rs.	Rs.
Road licence fees	750	750
Supervision and salaries	1,800	1,200
Garage rent	1,600	550
Insurance	850	500
Interest, @ 10% of vehicle cost	2,500	1,500
Total	7,500	4,500
Kilometreage per annum	15,000	6,000
Fixed expenses per km.	0·50	0·75
Variable expenses per km. :		
Driver's wages : Rs. 4÷20	0·20	0·20
Fuel costs : Rs. 1·50÷6	0·25	—
Rs. 1·50÷5		0·30
Repairs and maintenance	1·50	2·00
Depreciation : Rs. 25,000÷1,00,000	0·25	—
Rs. 15,000÷75,000	—	0·20
Operating cost per km.	2·7	3·45

Problem 4.

A company owns a number of taxis and the following information are available from the records maintained by the company :

(i)	Number of taxis	10
(ii)	Cost of each taxi	Rs. 20,000
(iii)	Salary of manager	Rs. 600 p.m.
(iv)	Salary of accountant	Rs. 500 p.m.
(v)	Salary of cleaner	Rs. 200 p.m.
(vi)	Salary of mechanic	Rs. 400 p.m.
(vii)	Garage rent	Rs. 600 p.m.
(viii)	Insurance premium	5% per annum
(ix)	Annual tax	Rs. 600 per taxi
(x)	Driver's salary	Rs. 200 p.m. per taxi
(xi)	Annual repair	Rs. 1,000 per taxi

Total service-life of a taxi is about 2,00,000 kms. A taxi runs in all 3,000 kms. in a month of which 30% it runs empty. Petrol consumption is one litre for 10 kms. @ Rs. 2 per litre. Oil and other sundries are Rs. 5·00 per 100 kms.

Calculate the cost of running a taxi per km.

(C. U., B. Com. Hons.)

Solution :

Statement of Operating Cost of a taxi for the period......

	Rs.	Rs.	Cost per km Rs.
Fixed costs per month (for the whole fleet)			
Salary of manager	600		
Salary of accountant	500		
Salary of cleaner	200		
Salary of mechanic	400		
Garage rent	600		
For 10 taxis	2,300		
∴ Per taxi Rs. 2,300 ÷ 10		230·00	
Driver's salary		200·00	
Insurance premium : $\frac{5\% \text{ of Rs. } 20,000}{12}$		83·33	
Taxes : $\frac{\text{Rs. } 600}{12}$		50·00	
Cost for 2,100 kms.¹		563·33	0·268
Variable expenses per km.			
Depreciation² : $\frac{\text{Rs. } 20,000}{70\% \text{ of } 2,00,000}$			0·143
Petrol : $\frac{3,000}{2,100} \quad \frac{\text{Rs. } 2}{10}$			0·286
Repairs : $\frac{\text{Rs. } 1,000}{12 \times 2,100}$			0·040
Oil and other sundries : $\frac{\text{Rs. } 5 \times 3,000}{100 \times 2,100}$			0·071
Cost per km.			0·808

Working Notes :

¹Effective running during the month 70% of 3,000 = 2,100 kms.

²Deprn./Hr. = $\frac{\text{Cost}}{\text{Effective life in km.}}$

Problem 5.

A transport company supplies the following details in respect of a truck of 5 ton capacity :

Cost of truck	Rs. 90,000
Estimated life	10 years
Diesel, oil, grease	Rs. 15 per trip each way
Repairs and maintenance	Rs. 500 per month
Driver's wages	Rs. 500 per month
Cleaner's wages	Rs. 250 per month
Insurance	Rs. 4,800 per year
Taxes	Rs. 2,400 per year
General supervision charges	Rs. 4,800 per year

The truck carries goods to-and-from the city covering a distance of 50 kms. each way. On upward trip freight is available to the extent of full capacity and on return, only to the extent of 20% of capacity.

Assuming that the truck runs, on an average, 25 days a month, work out :

(a) Operating cost per ton-kilometre.

(b)   Rate per ton per trip that the company should charge, if a profit of 50% on freightage is to be earned.

Solution :

(a)   **Statement of Operating Cost**

Period...............

	Per month Rs.	Per ton-km. Rs.
Fixed Costs :		
Driver's wages	500	
Cleaner's wages	250	
Insurance : Rs. 4,800÷12	400	
Taxes : Rs. 2,400÷12	200	
General supervision : Rs. 4.800÷12	400	
For 7,500 ton-kms.	1,750	0·233
Variable Costs :		
Diesel, oil, grease : Rs. 15×2×25	750	
Depreciation : $\frac{Rs.\ 90,000}{10\times12}$	750	
Repairs and maintenance	500	
For 7,500 ton-kms.	2,000	0·267
Cost per ton-km.		0·500

Working Notes :

1. It has been assumed that the truck makes only one trip per day. •
2. Ton-kms. per month :

Onward trip :   5 tons×50 kms.×25 days= 6,250 ton kms.

Return trip :   1 ton ×50 kms.×25 days= 1,250 ton-kms.

7,500 ton-kms.

(on return journey it carries 20% of 5 tons i.e., 1 ton.)

(b)   **Freightage to be charged**

Operating cost per ton-trip @ Re. 0·50	Rs.
for 50 ton-kms.	25
Add : Profit 50% of freightage, i.e. 100% of cost	25
Freightage per ton per trip	50

Problem 6.

A transport company maintains a fleet of buses as follows :

No. of buses	*Carrying Capacity*
10	60 passengers each
5	40 „ „

Each bus makes 4 trips (i.e., both upward and downward journeys in one trip) in a day, covering a distance of 5 kilometres in each journey in each trip.   On an average, 75% of the seats are occupied in each trip.   Assuming that the company operates its fleet 25 days in a month, ascertain   operating

cost per passenger-kilometre, taking into account the following further information :

Wages of 15 drivers	Rs. 250 each p.m.
Petrol, oil, grease etc.	Rs. 3,000 p.m.
Repairs	Rs. 1.500 p.m.
Tyre, tube etc.	Rs. 375 p.m.
Depreciation	Rs. 90,000 p.a.
Garage rent	Rs. 9,000 p.a.
Interest on capital	Rs. 12,000 p.a.
General supervising charges	Rs. 3,000 p.a.

(C. U., M. Com.)

Solution :

Statement of Operating Cost

Period..........

		Per month Rs.	Per passenger-km. in Paise
Fixed Costs			
Wages : 15 drivers @ Rs. 250 p.m.	...	3,750	
Garage rent : Rs. 9.000 ÷ 12	..	750	
Interest on capital : Rs. 12,000 ÷ 12	..	1,000	
General supervision charges : Rs. 3,000 ÷ 12	..	250	
For 6,00,000 passenger-kms.	..	5,750	0·9583
Variable Costs :			
Petrol, Oil, Grease etc.	...	3,000	
Repairs	..	1,500	
Tyre, tube etc.	...	375	
Depreciation : Rs. 90,000 ÷ 12	..	7,500	
For 6,00,000 passenger-kms.	...	12,375	2·0625
Cost per passenger-km.	...		3·0208

(Cost per passenger-km. is 3·0208 paise or Re. ·0302208).

Working Notes :

Calculation of passenger-kms. per month

Kms. run per month :	Rs.
10 buses × (4 × 2 × 5 kms.) × 25 days	10,000
5 buses × (4 × 2 × 5 kms.) × 25 days	5,000
	15,000
Passenger-kms. per month :	
75% of 60 seats = 45 × 10,000	4,50,000
75% of 40 seats = 30 × 5,000	1,50,000
	6,00,000

Problem 7.

A factory which uses a large quantity of coal is situated between two collieries 'P' and 'Q', the former being 5 kilometres and the latter 10 kilometres distant from the factory. A fleet of lorries of 5 ton carrying capacity is used for the collection of coal from the pit-heads. The lorries' average a speed of 20 kilometres per hour when running and they regularly

take 10 minutes in the factory premises to unload. At colliery 'P' loading time averages 30 minutes per load, and at colliery 'Q' 20 minutes per load.

Driver's wages, licences, insurance, depreciation, garage and similar charges are noticed to cost Rs. 6 per hour operated. Fuel, oil, tyres, repairs and similar charges are noticed to cost 60 paise per kilometre run.

Draw up a statement showing the cost per kilometre of carrying coal from each colliery. If the coal is of equal quality and price at pit-head from which colliery the purchases should be made ?

Solution :

Time taken per trip	*Colliery 'P'*	*Colliery 'Q'*
Loading time	30 mts.	20 mts.
Unloading time	10 .	10 ..
To-and-fro travelling time	30 .	60 ..
(10 km. for *P* and 20 km. for *Q* @ 20 km./hr.)		
	70 mts.	90 mts.

Statement of cost per ton-kilometre of carrying coal

	Colliery 'P'	*Colliery 'Q'*
	Rs.	Rs.
Fixed cost per trip @ Rs. 6 per hr.	(6 × ..) 7	(Rs. 6 × ..) 9
Running cost per trip @ Re. 0·60 per km. run	(Re. 0·60 × 5 × 2)=6	(Re. 0·60 × 10 × 2) 12
Cost per trip	13	21
Cost per ton-km.	(Rs. ..)=0·52	(Rs. ..) 0·42
Cost per ton	(Rs. ..) 2·60	(Rs. 4·20)

In spite of lower cost per ton-kilometre in case of colliery *Q*, it is preferable to purchase from colliery *P*, because it involves a lesser distance and hence a lower cost per ton.

Problem 8.

Mr. Sensarma is a travelling inspector for the Environmental Protection Agency. He uses his own car and the Agency reimburses him at Rs. 1·80 per kilometre. Mr. Sensarma claims he needs Rs. 2·20 per kilometre just to break even. A scrutiny of his expenses by the Agency reveals the following :

	Rs.
Oil charge every 4,800 kms.	120
Maintenance (other than oil) every 9,600 kms.	1,800
Yearly Insurance (comprehensive with accident benefits)	4,000
Cost of car with an average residual value of Rs. 60,000 and with a useful life of 3 years	1,08,000

Petrol is Rs. 5 a litre and Sensarma gets 8 kms. per litre in his car. When Sensarma is on the road, he averages 192 kilometres a day. He

works 5 days a week, has 10 days vacation in a year, besides 6 holidays, and spends 15 working days a month in the office.

You are required to determine—

(a) an equitable rate of reimbursement on the basis of the schedule he presently follows ; and (b) the number of kilometres a year he would have to travel, to break even at the current rate of reimbursement.

(I. C. W. A. Inter.—adapted)

Solution :

(a) Equitable rate of reimbursement on the basis of present schedule

Distance travelled in a year--

No. of days in a year			365 days
Less : Vacation	10 days		
Holidays	6 days		
Office work 15 × 12	180 days		
Week-ends 2 × 52	104 days		300 days
No. of days travelled			65 days

Distance travelled : 65 × 192 = 12,480 kms.

Statement of Operating Cost

	Rs.	Rs.
Fixed Costs :		
Insurance	4,000	
Depreciation $\frac{1}{3}$ × (Rs. 1,08,000 — 60,000)	16,000	20,000
Variable costs :		
Oil charge $\frac{12,480}{4,800}$ × Rs. 120	312	
Maintenance $\frac{12,480}{9,600}$ × Rs. 1,800	2,340	
Petrol $\frac{12,480}{8}$ × Rs. 5	7,800	10,452
Total cost per 12,480 kms.		30,452

Rate of reimbursement required = $\frac{Rs.\ 30,452}{12,480}$ = Rs. 2·44 per km.

(b) No. of kms. to be travelled to break even at the current rate of reimbursement :

Variable cost per km. $\frac{Rs.\ 10,452}{12,480}$ = Re. 0·8375

Contribution = Reimbursement — Variable cost

= Re. (1·80 — 0·8375) = Re. 0·9625 per km.

Distance to be travelled to meet the fixed costs of Rs. 20,000

$\frac{20,000}{0·9625}$ = 20,780 kms.

EXERCISES

Theoretical :

1. What is operating cost ? To what industries is this method of costing applicable ?

2. What are the advantages derived from ascertaining Operating Cost ? To which industries is it suitable ?

3. Distinguish between 'Operating Costing' and 'Operation Costing'. Name four industries where operating costing is applicable.

4. Write a short note on 'units' used in operating costing.

5. What is 'composite unit' ? Give three examples of composite unit. Discuss the principle applied in the selection of composite unit in cost accounting.

6. List six types of industries that are likely to use operating costing method, and for each suggest the cost unit that would be adopted.

7. What records should a transport company maintain in respect of each vehicle to determine cost per unit of service rendered.

Practical :

1. From the following data calculate the cost per km. of a vehicle :

	Rs.
Cost of vehicle	15,000
Road licence fee per year	500
Insurance charges per year	100
Garage rent per year	600
Driver's wages per month	200
Cost of petrol per litre	0·80
Kilometres run per litre	--
Proportionate charge for tyre and maintenance per km.	0·20
Estimated life	1 50,000 kms.
Estimated annual kilometreage	6,000
Ignore interest on capital	

2. The following cost data pertaining to the year 1989-90 have been collected from the books of Surma Valley Power Co. Ltd. Prepare a cost sheet showing the cost of generation of power per kwh.

		Rs.
Total units generated	15,00,000 kwh.	
Operating labour		16,500
Plant supervision		5,250
Lubricants and supplies		10,500
Repairs and maintenance		21,000
Administrative overhead		9,000
Capital cost		1,50,000

Coal consumed per kwh. is 1·5 lbs. and cost of coal delivered to the power station is Rs. 33·06 per metric ton. Depreciation rate chargeable is 4% per annum and interest on capital is to be taken at 7%.

Note : One metric ton is equal to 2,205 lbs.

3. The following figures have been extracted from the books of Ballal Ltd., for the year 1989-90 :

Passenger buses : 5 numbers costing Rs. 50,000. Rs. 45,000, Rs. 1,20,000, Rs. 55,000 and Rs. 80,000 respectively.

Yearly depreciation of vehicles : 20 per cent of the cost.

Annual repair, maintenance and spare parts . 80 per cent of depreciation.

Wages of 10 drivers : at Rs. 200 each per month.

Wages of 20 cleaners : at Rs. 100 each per month.

Yearly rate of interest : 12 per cent on capital cost.

Directors' remuneration : at Rs. 800 per month.

Rent of six garages : at Rs. 100 each per month.

Office establishment : at Rs. 2.000 per month.

License and taxes : at Rs. 2.000 every six months.

Realisation of sales proceeds of old tyres and tubes : at Rs. 0.400 every six months.

900 passengers were carried over 2.400 kms. per day during the year.

Compute the unit cost per passenger-kilometre.

4. Mercury Travels, a transport company, is running a fleet of six buses between two towns 75 km. apart. Seating capacity of each bus is 40 passengers. The following particulars are available for the month of June, 1989 :

	Rs.
Wages of drivers, conductors and cleaners	3,600
Salaries of office and supervisory staff	1.500
Diesel and other oils	10.320
Repairs and maintenance	1.200
Taxation. Insurance. etc.	2,400
Depreciation	3,900
Interest and other charges	3.000

Actual passengers carried were 80 per cent of the seating capacity. All the buses ran on all days of the month. Each bus made one round-trip per day.

Find out the cost per passenger-kilometre.

5. A bus plys between two points at a distance of 15 km. It is on road for 25 days a month on an average. It makes 5 upward and 5 downward trips per day. Its capacity is 50 and on an average 80% is full. The expenses are :

		Rs.
Driver's salary p.m.		300
Salary of conductors and cleaners p.m.		500
Petrol. etc. p.m.		3,500
Cost		80,000
Estimated life	5 years	—
Insurance, Taxes p.a.		3,000
Repairs and Renewals p.a.		4,000

Calculate the cost per passenger-kilometre.

6. Mr. Sen owns a fleet of taxis and the following information is available from the records maintained by him :

Number of taxis	10
Cost of each taxi	Rs. 54.600
Salary of manager	Rs. 700 p.m.
Salary of accountant	Rs. 500 p.m.
Salary of cleaner	Rs. 200 p.m.
Salary of mechanic	Rs. 400 p.m.
Garage rent	Rs. 600 p.m.
Insurance premium	5% p.a.
Annual tax	Rs. 900 per taxi
Drivers' salary	Rs. 350 p.m. per taxi
Annual repairs	Rs. 1,000 per taxi

Total life of a taxi is about 2,00,000 kms. A taxi runs, in all, 3,000 kms. in a month and 30% of this distance has to be run without any passenger. Petrol consumption is one litre for every 10 kms. @ Rs. 4·41 per litre. Oil and other sundries are Rs. 10·50 per 100 kms.

Calculate the cost of running a taxi per km.

7. Mr. B. Khan has started transport business with a fleet of 10 taxis. The various expenses incurred by him are given below :

	Rs.
Cost of each taxi	75.000
Salary of office staff	1.500 p.m.
Salary of garage staff	2.000 p.m.
Rent of garage	1.000 p.m.
Driver's salary (per taxi)	400 p.m.
Road tax and Repairs (per taxi)	2,160 p.a
Insurance premium	@ 4% of cost p.a.

The life of a taxi is 3,00,000 kms. and at the end of which it is estimated to be sold at Rs. 15,000. A taxi runs on an average 4,000 kms. per month of which 20% it runs empty. Petrol consumption is one litre per 9 kms. costs of petrol is Rs. 6·30 per litre. Oil and other sundry expenses amount to Rs. 10 per 100 kms.

Calculate the effective cost of running a taxi per kilometre. If the hire charge rate is Rs. 1·80 per kilometre, find out the profit Mr. B. Khan may expect to make in the first year of operation.

8. From the following details, relating a transport company, calculate the fare to be charged on a passenger who travels 5 kms. The company decides to earn a profit of 25% on the fare.

A bus with a carrying capacity of 50 passengers plys between to points at a distance of 20 kms. It is not on road for 6 days a month on an average. It runs 6 upward and 6 downward trips per day. It runs a full capacity execpt on 2 upward trips when only 50% capacity is utilised. The expenses are as follows :

Cost of the bus—Rs. 1,50,000 ; Life 3,00,000 kms., Driver's salary per month—Rs. 600, Salary of conductors and cleaners—Rs. 700 p.m., Fuel,

grease etc.—Rs. 6,000 p.m., Insurance and taxes—Rs. 8,400 p.m., : Repairs and renewals—Rs. 4,800 p.a. ; Tyres and tubes etc. –Rs. 6,000 p.a. ; Sales of scrapped tyres and tubes etc.—Rs. 1,500 p.a.

9. The following were the expenses incurred by a company in operating two lorries (for carrying raw materials) and a bus (for the conveyance of staff) during a selected month :

| | *Monthly Cost* | | |
| | *Lorry A* | *Lorry B* | *Bus* |
	Rs.	Rs.	Rs.
Driver's salaries	110	115	120
Cleaner's wages	120	120	60
Petrol	170	240	110
Oil	18	25	20
Repairs	150	150	100
Depreciation	330	220	350
Supervision	70	70	70
Garage overhead	130	110	75
Road and other taxes	45	45	30
Other overhead expenses	35	40	20

The above vehicles carried the following raw materials and passengers during the month :

Lorry *A*	100 tons of raw material
Lorry *B*	120 tons of raw material
Bus	25 passengers daily for 25 days

At the same time, their respective mileage during the same period were :

Lorry *A*	3,000
Lorry *B*	4,500
Bus	2,000

From the above statistics prepare an operating cost sheet in summary form for the three vehicles. Also explain the unit of costing selected.

10. A chemical factory runs its boiler on furnace oil obtained from Indian Oil and Bharat Petroleum, whose depots are situated at a distance of 12 kms. and 8 kms. from the factory site. Transportation of furnace oil is made by the company's own tank lorries of 5 tons capacity each. Onward trips are made only on full load and the lorries return empty. The filling-in time takes an average 40 minutes for Indian Oil and 30 minutes for Bharat Petroleum. But the emptying time in the factory is only 40 minutes for all. From the records available, it is seen that the average speed of the company's lorries works out to 24 kms. per hour. The varying operating charges average 60 paise per km. covered and fixed charges give an incidence of Rs. 7·50 per hour of operation. Calculate the cost per ton-km. for each source.

SECTION I
COST CONTROL ACCOUNTS

From our knowledges of financial accounting we all know that there are three types of accounts, viz. :

(a) Personal Accounts i.e., accounts of persons.

(b) Real Accounts i.e., accounts of assets and possessions.

(c) Nominal Accounts i.e., accounts of incomes, expenses, gains and losses.

In most of the firms a cost department is maintained where detailed cost statements, reports etc., are produced. Cost department is mainly concerned with nominal accounts and to some extent with real accounts, which are considered as impersonal accounts. The financial accounting department is concerned with all the three types of accounts mentioned above. In other words, cost department is concerned with the income and expenditure of the firm. *Financial Accounting Department and Cost Department operate separate ledgers except where integrated accounts are maintained.* (It will be seen later that under integrated accounting system only one set of books is maintained).

Ledger Maintained

Financial Accounting Department maintains—

(a) *General Ledger*, (b) *Debtors' Ledger*, and (c) *Creditors' Ledger*. Cost Department maintains—

(a) *Cost Ledger*, (b) *Stores Ledger*, (c) *Work-in-progress Ledger* and (d) *Finished Goods Ledger*.

Cost Ledger is the most important ledger of the Cost Department. Impersonal accounts are recorded in it.

Stores Ledger maintains all stores accounts (an account being kept for each item of store)

Work-in-progress Ledger records production during a period and the cost incurred therefor. Each job, process or operation will have a separate number, and for each, an account will be maintained in this ledger.

Finished Goods Ledger records all products completed. An account is opened for each product.

For effective control over all the activities a *Control Account* is maintained for each of the above ledgers. Cost ledger contains all these four Control Accounts and often others like Material Control Account.

Let us discuss the Control Accounts.

1. **Cost Ledger Control Account :**

All items of income and expenditure extracted from the Financial Accounts are posted in this account. Transfers from Cost Books to Financial Books (e.g., cost of capital project of the factory) are also entered in this account. The object of this account is to complete double entry in the Cost Ledger. The balance of this account represents the total of all the balances of impersonal accounts. This account is often called *General Ledger Adjustment Account*.

2. **Stores Ledger Control Account :**

This account shows the receipts of materials as per Goods Received Notes and the issues of materials as per Stores Requisitions. The balance of this account represents the total of the balances of stores accounts.

Sometimes *Material Control Account* is maintained to see that total receipts of materials (as per invoices) and total transfers to Stores Ledger Control Account (as per Goods Received Notes agree.

3. **Work-in-progress Ledger Control Account :**

It represents the total work-in-progress at any time. Its balance at the end of a period must agree with the total of the balances of the Job Accounts.

4. **Finished Goods Ledger Control Account :**

This account represents the total value of finished goods in stock.

In the Financial Books a *Cost Ledger Control Account* is opened to record all the items of income and expenditure that affect the Cost Accounts. This account contains the same items as in the corresponding account in the Cost Books, *but on the opposite side of the account.*

[It will be discussed later that there are many items which are regarded as purely financial and hence are not recorded in Cost Books.]

Let us see how entries are made in Financial Books and Cost Books.

Let us assume that materials worth Rs. 500 are purchased from M/s. Bajoria & Co. on credit.

In the Financial Books—

    Main entry—Purchase (Materials) Account   Dr.   Rs. 500
                    To Bajoria & Co. Account   Rs. 500

An entry will also be made on the debit side of Cost Ledger Control Account (memorandum) maintained in the Financial Books.

In Cost Books—

    Material Control Account   Dr.   Rs. 500
        To Cost Ledger Control Account[1]   Rs. 500

[*Note :* ¹Cost Ledger Control Account may be replaced by General Ledger Adjustment Account. Whatever it might be, it is maintained in Cost Books.]

Cost Accounts

The accounts to be opened in cost ledger should be in accordance with the elements of cost. The elements of cost are—

> Direct Material
> Direct Wages
> Chargeable Expenses
> Production overhead
> Administration Overhead
> Selling & Distribution Overhead.

The accounts to be opened in Cost Ledger are—

(a) *Cost Ledger Control Account (General Ledger Adjustment Account)*

(b) *Material Control Account*

(c) *Stores Ledger Control Account*

(d) *Wages Control Account*

(e) *Production Overhead Account*

(f) *Administration Overhead Account*

(g) *Selling & Distribution Overhead Account*

[For chargeable expenses no separate account is required, these are directly debited to production.]

Main items of expenditure shall be recorded in the above accounts. In order to ascertain the cost of production the following two accounts are opened :

(h) *Work-in-progress Ledger Control Account*

(i) *Finished Goods Ledger Control Account*

The finished goods sold are transferred to Cost of Sales Account. So another account is opened, namely—

Cost of Sales Account to show total selling and distribution overheads *recovered* which together with the cost of production of the finished goods sold, represents cost of sales.

Finally, *Costing Profit & Loss Account* is prepared to ascertain profit or loss. In this account, cost of sales is debited and sales are credited. Overhead adjustment accounts balances, if any, are also transferred to this account. Final balance represents profit or loss.

Book-keeping Entries

1. **For Purchase of materials during a period :**

    (a) *In Financial Books—*

        Purchase A/c   Dr.

        Cost Ledger Control A/c (*Memorandum*) Dr.

            To Cash/Supplier A/c   Dr.

    (b) *In Cost Books—*

        (i) Material Control A/c   Dr.

            To Cost Ledger Control A/c

(ii) Stores Ledger Control A c[1]   Dr.
       To Material Control A/c

[*Note* : ¹If any amount of purchase relates to any special job, for that amount Work-in-Progress Ledger Control A/c shall be debited and for the balance of the purchase, Stores Ledger Contol A'c will be debited in entry b(ii) above.]

2. **For return of materials purchased**
    (a) *In Financial Books*---
         Suppliers   Dr.
             To Purchase Return A'c
             „   Cost Ledger Control A c (*Memorandum*)
    (b) *In Cost Books—*
         Cost Ledger Control A/c   Dr.
             To Stores Ledger Control A/c

3. **For issue of materials to production**
    (a) *In Financial Books—*
         No entry
    (b) *In Cost Books—*
         Work-in-Progress Ledger Control A/c   Dr.
             To Stores Ledger Control A/c

[*Note* : Individual Job A/cs in Work-in-Progress Ledger will be debited and Individual Stores A/cs in Stores Ledger will be credited.]

4. **For issue of indirect materials**
    (a) *In Financial Books—*
         No entry
    (b) *In Cost Books—*
         Factory Overhead Control A'c   Dr.
             To Stores Ledger Control A c

[*Note* : Individual Stores A/cs in Stores Ledger will be credited, while the total will be debited to Factory Overhead A/c.]

5. **For return of materials from production to stores**
    (a) *In Financial Books—*
         No entry
    (b) *In Cost Books—*
         Stores Ledger Control A/c   Dr.
             To Work-in-Progress Ledger Control A/c

[*Note* : Individual Stores A/cs in Stores Ledger will be debited and Individual Job A/cs in Work-in-Progress will be credited.]

6. **For transfer of materials from one Job to another Job**
    (a) *In Financial Books—*
         No entry
    (b) *In Cost Books —*
         (Receiving) Job A/c   Dr.
             To (giving) Job A/c

Cost (Part I)—40

[*Note* : This transaction will be confined in these two accounts only and will not affect Work-in-Progress Ledger Control A/c or Stores Ledger Control A/c.]

7. For wages (gross) accruing for a period

    (a) *In Financial Books—*

        Wages A/c   Dr. *(Gross Wages)*

        Cost Ledger Control A/c *(Memorandum)* **Dr.**

            To Cash *(Net amount paid)*

           ,, Various Accounts for deductions

    (b) *In Cost Books—*

        (i) Wages Control A/c   Dr. *(Gross Wages)*

              To Cost Ledger Control A/c

        (ii) Total wages will be first analysed into—direct wages and indirect wages. The latter will be further analysed into Production Staff, Administration Staff, Selling & Distribution Staff.

        For direct wages—

           Work-in-Progress Control A/c   Dr. *(Individual Job A/cs)*

             To Wages Control A/c

      For indirect wages according to further analysis—

           Factory Overhead Control A/c   Dr.

           Administration Overhead Control A/c   Dr.

           Selling & Distribution Overhead Control A/c Dr.

             To Wages Control A/c

8. For overhead expenses accruing for a period

    (a) *In Financial Books—*

        Expense A/c   Dr.

        Cost Ledger Control A/c *(Memorandum)*   Dr.

            To Creditors A/c

    (b) *In Cost Books*—The total expenses shall be analysed into Production, Administration, Selling & Distribution. Entry will be according to the analysis, as shown below—

           Factory Overhead Control A/c   Dr.

            Administration Overhead Control A/c   Dr.

            Selling & Distribution Overhead Control A/c Dr.

             To Cost Ledger Control A/c

9. For payment of expenses accrued

    (a) *In Financial Books—*

        Creditors A/c   Dr.

            To Cash

    (b) *In Cost Books—*

        No entry

It is seen that various overhead accounts have been debited for indirect materials, indirect wages and expenses. It is now required to record in the cost ledger the overheads that have been recovered from jobs.

Work-in-Progress ledger will say how much overhead has been recovered during a period, because with the completion of a period, the respective Job Accounts are debited with the appropriate charge for factory overhead and the total of these charges shows the amount of factory overhead recovered during the period.

10. **For total factory overhead recovered during a period**
    (a) *In Financial Books—*
      No entry
    (b) *In Cost Books—*
      Work-in-Progress Ledger Control A/c   Dr.
        To Factory Overhead Control A/c

11. **For over- or under-recovery of factory overhead**
    (a) *In Financial Books—*
      No entry
    (b) *In Cost Books—*
      (i) For over-recovery—
          Factory Overhead Control A/c   Dr.
            To Overhead Adjustment A/c (or, Costing Profit & Loss A/c)
      (ii) For under-recovery—
          Overhead Adjustment A/c (or, Costing Profit & Loss A/c) Dr.
            To Factory Overhead Control A/c.

[*Note* : Over- or under-recovery of factory overhead may be written off to Costing Profit & Loss A/c or it may be adjusted through a supplementary rate or it may be carried forward to the next year.]

12. **For administration overhead recovery**
    (a) *In Financial Books—*
        No entry
    (b) *In Cost Books—*
      Finished Goods Ledger Control A/c   Dr.
        To Administration Overhead Control A/c
    Any over- or under-recovery will be transferred to Overhead Adjustment Account.

13. **For selling and distribution overhead recovery**
        Cost of Sales A/c   Dr.
          To Selling & Distribution Overhead Control A/c
    Any over- or under-recovery will be transferred to Overhead Adjustment Account.

14. **For sales during a period**
    (a) *In Financial Books—*
      Cash/Customers A/c   Dr.
        To Sales A/c
        To Cost Ledger Control A/c (*Memorandum*)
    (b) *In Cost Books—*
      Cost Ledger Control A/c   Dr.
        To Costing Profit & Loss A/c

15. For Profit or Loss during a period

    (a) *In Financial Books—*

·   Credit balance of Profit & Loss A/c represents net profit and debit balance of Profit & Loss A/c represents net loss. These are carried forward.

    (b) *In Cost Books—*

        (i) For Net Profit—

            Costing Profit & Loss A/c   **Dr.**

               To Cost Ledger Control A/c

        (ii) For Net Loss—

            Cost Ledger Control A/c   **Dr.**

               To Costing Profit & Loss A/c

WORKED-OUT PROBLEMS

Problem 1.

    From the following figures ascertained from costing records and financial books of a factory you are required to pass necessary entries in the cost journal (assume that a system of maintaining control accounts prevails in the organisation)

	Rs.
Purchases	4,20,000
Carriage Inward	6,250
Stores issued	4,08,200
Productive Labour	4,16,520
Unproductive Labour	1,82,780
Works Overhead	3,68,900
Materials used in repairs	2,560
Cost of completed jobs	14,50,240

Solution

Entries in the Cost Journal	*Dr.*	*Cr.*
	Rs.	Rs.

Stores Ledger Control A/c   ... **Dr.**
   To Cost Ledger Control A/c
(Total amount of purchases for the period as
  ascertained from financial books)
	4,20,000	4,20,000

Stores Ledger Control A/c   ... **Dr.**
   To Cost Ledger Control A/c
(Amount of carriage inwards as per financial
  books)
	6,250	6,250

Work-in-Progress Control A/c   ... **Dr.**
   To Stores Ledger Control A/c
(Amount of stores issued as per Materials
  Abstract)
	4,08,200	4,08,200

Wages Control A/c ... **Dr.** To Cost Ledger Control A/c (Amount of direct and indirect wages expended)	5,99,300	5,99,300
Work-in-Progress Control A/c ... **Dr.** To Wages Control A/c (Amount of direct wages allocated to jobs)	4,16,520	4,16,520

Journal (Contd.)

	Rs.	Rs.
Works Overhead Control A/c ... Dr.	1,82,780	
To Wages Control A/c		1,82,780
(Amount of indirect labour allocated to works overhead)		
Works Overhead Control A/c ... Dr.	3,68,900	
To Cost Ledger Control A/c		3,68,900
(Amount of works expenses other than indirect wages, as per financial books)		
Works Overhead Control A/c ... Dr.	2,560	
To Cost Ledger Control A/c		2,560
(Cost of materials used in repairs)		
Finished Goods Ledger Control A/c ... Dr.	14,50,240	
To Work-in-Progress Control A/c		14,50,240
(Cost of completed jobs transferred from work-in-progress accounts)		

Problem 2.

Pass journal entries for the following transactions in a double entry cost accounting system :

			Rs.
(a)	Issue of material :		
	Direct		5,50,000
	Indirect		1,50,000
(b)	Allocation of Wages and Salaries :		
	Direct		2,00,000
	Indirect		40,000
(c)	Overheads absorbed in jobs :		
	Factory		1,50,000
	Administration		50,000
	Selling		30,000
(d)	Under/over-absorbed overheads :		
	Factory (over)		20,000
	Administration (under)		10,000

(I. C. W. A. Inter.)

Solution :

	Cost Journal	*Dr.*	*Cr.*
		Rs.	Rs.
(a)	Work-in-Progress Control A/c ... Dr.	5,50,000	
	Factory Overhead Control A/c ... Dr.	1,50,000	
	To Stores Ledger Control A/c		7,00,000
	(Amount of direct and indirect materials issued)		
(b)	Work-in-Progress Control A/c ... Dr.	2,00,000	
	Factory Overhead Control A/c ... Dr.	40,000	
	To Wages Control A/c		2,40,000
	(Amount of direct wages allocated to jobs and indirect wages allocated to factory overhead)		

Journal (Contd.)

			Rs.	Rs.
(c)	Work-in-Progress Control A/c ... **Dr.** To Factory Overhead Control A/c (Amount of factory overhead in jobs)		1,50,000	1,50,000
	Finished Goods Control A/c ... **Dr.** To Admn. Overhead Control A/c (Amount of administration overhead absorbed in jobs)		50,000	50,000
	Cost of Sales A/c ... **Dr.** To Selling Overhead Control A/c (Amount of selling overhead recovered from sales)		30,000	30.000
(d)	Factory Overhead Control A/c ... **Dr.** To Overhead Adjustment A/c (Amount of over-recovered factory overhead transferred)		20,000	20,000
	Overhead Adjustment A/c ... **Dr.** To Admn. Overhead Cantrol A/c (Amount of under-recovered admn. overhead transferred)		10,000	10,000

Problem 3.

The following balances are extracted from the cost ledger of Lindwal Ltd. as at 1st April, 1990 :

	Dr. Rs.	Cr. Rs.
Stores Ledger Control A/c	8,000	
Work-in-Progress Ledger Control A/c	6,000	
Finished Goods Ledger Control A/c	2,000	
General Ledger Adjustment A/c	—	16,000
	16,000	16,000

The following information is obtained at the end of a half year

		Rs.
Purchase of materials—general		35,000
—for a special job		5,000
Direct Wages	28,000	
Indirect Factory Wages	8,000	
Administrative Salaries	5,000	
Selling & Distribution Salaries	4,000	45,000
Factory Expenses		9,000
Administration Expenses		6,000
Selling & Distribution Expenses		4,000
Materials issued to Production		37,000
Materials issued to Production as indirect		2,000
Materials returned to Suppliers		500

	Rs.
Factory overhead absorbed	20,000
Administration Overhead absorbed	10,800
Selling & Distribution Overhead absorbed	7,900
Product completed during the half year	86,000
Cost of finished products sold	94,800
Sales for the half-year	1,12,000

Record the transactions in Cost Ledger and draw a Trial Balance as on 30-9-90.

Solution :

<div align="center">

COST LEDGER

</div>

Dr.   **General Ledger Adjustment A/c**   *Cr.*

30.9.90	Rs.	1.4.90	Rs.
To Stores Ledger Control A/c (return)	500	By Balance b/f	16,000
,, Costing Profit & Loss A/c (Sales)	1,12,000	30.9.90	
,, Balance c/f	17,500	By Stores Ledger Control A/c	35,000
		,, Work-in-Progress Ledger Control A/c	5,000
		,, Wages Control A/c	45,000
		,, Factory Overhead Control A/c	9,000
		,, Administration Overhead Control A/c	6,000
		,, Selling & Distribution Overhead Control A/c	4,000
		,, Costing Profit & Loss A/c (Net Profit)	10,000
	1,30,000		1,30,000

Dr.   **Stores Ledger Control A/c**   *Cr.*

1.4.90	Rs.	30.9.90	Rs.
To Balance b/f	8,000	By Work-in-Progress Ledger Control A/c	37,000
30.9.90		,, Factory Overhead Control A/c	2,000
To Genl. Ledger Adjustment A/c	35,000	,, Genl. Ledger Adjustment A/c (return)	500
		,, Balance c/f	3,500
	43,000		43,000

Dr.   **Wages Control A/c**   *Cr.*

30.9.90	Rs.	30.9.90	Rs.
To Genl. Ledger Adjustment A/c	45,000	By Work-in-Progress Ledger Control A/c	28,000
		,, Factory Overhead Control A/c	8,000
		,, Administration Overhead Control A/c	5,000
		,, Selling & Distribution Overhead Control A/c	4,000
	45,000		45,000

Dr.   Factory Overhead Control A/c   *Cr.*

30.9.90	Rs.	30.9.90	Rs.
To Genl. Ledger Adjustment A/c	9.000	By Work-in-Progress Control A/c	20,000
„ Stores Ledger Control A/c	2 000	(recovery)	
„ Wages Control A/c	8,000		
„ Overhead Adjustment A/c	1,000		
	20,000		20,000

Dr.   Administration Overhead Control A/c   *Cr.*

30.9.90	Rs.	30.9.90	Rs.
To Genl. Ledger Adjustment A/c	6,000	By Finished Goods Ledger Control A/c	10 800
„ Wages Control A/c	5,000	„ Overhead Adjustment A/c	200
	11,000		11 000

Dr.   Selling & Distribution Overhead Control A/c   *Cr.*

30.9.90	Rs.	30.9.90	Rs.
To Genl. Ledger Adjustment A/c	4,000	By Cost of Sales A/c	7,900
„ Wages Control A/c	4,000	„ Overhead Adjustment A/c	100
	8,000		8,000

Dr.   Work-in-Progress Ledger Control A/c   *Cr.*

1.4.90	Rs.	30.9.90	Rs.
To Balance b/f	6,000	By Finished Goods Ledger	
„ Genl. Ledger Adjustment A/c	5.000	Control A/c	86.000
(Spl. purchase)		„ Balance c/f	10 000
„ Stores Ledger Control A/c	37,000		
„ Wages Control A/c	28.000		
„ Factory Overhead Control A/c	20.000		
	96,000		96.000

Dr.   Finished Goods Ledger Control A/c   *Cr.*

1.4.90	Rs.	30.9.90	Rs.
To Balance b/f	2.000	By Cost of Sales A/c	94,800
„ Administration Overhead Control A/c	10,800	„ Balance c/f	4,000
„ Work-in-Progress Ledger Control A/c	86,000		
	98,800		98,800

Dr.   Cost of Sales A/c   *Cr.*

30.9.90	Rs.	30.9.90	Rs.
To Selling & Distribution Overhead Control A/c	7,900	By Costing Profit & Loss A/c (Cost of sales transferred)	1,02,700
„ Finished Goods Ledger Control A/c	94,800		
	1,02,700		1,02,700

Dr.		Overhead Adjustment A/c	Cr.
30-9-90	Rs.	30-9-90	Rs.
To Administration Overhead Control A/c	200	By Factory Overhead Control A/c	1,000
.. Selling & Distribution Overhead Control A/c	100		
.. Costing Profit & Loss A/c	700		
	1,000		1,000

Note : ¹As umed that over- or under-recovery are written off.

Costing Profit & Loss A/c

Dr.		*for the half-year ended 30.9.90*	Cr.
	Rs.		Rs.
To Cost of Sales A/c	1,02,700	By Genl. Ledger Adjustment A/c Sales	1,12,000
.. Genl. Ledger Adjustm nt A/c —net profit	10,000	.. Overhead Adjustment A/c	700
	1,12,700		1,12,700

Trial Balance *as at 30-9-90*

	Dr. Rs.	Cr. Rs.
Stores Ledger Control A/c	3,500	
Work-in-Progress Ledger Control A/c	10,000	
Finished Goods Ledger Control A/c	4,000	
General Ledger Adjustment A/c	—	17,500
	17,500	17,500

[*Note* : General Ledger Adjustment A/c is often referred to as *Cost Ledger Control A/c.*]

Problem 4.

From the following details show necessary accounts in the cost ledger and prepare a Trial Balance as on 31.12.89 :

	Rs.
Balances on 1.1.89	
Materials	10,000
Work-in-Progress	6,000
Finished goods	12,000
Balances on 31.12.89	
Materials	13,000
Work-in-Progress	8,000
Finished goods	15,000

Materials purchased during the year Rs. 35,000 ; Wages paid —direct Rs. 16,000, indirect Rs. 4,000 ; Factory Overhead incurred Rs. 11,000 (Factory overhead recovered Rs. 14,000) ; Administration Overhead incurred

Rs. 5,000 (Recovered Rs. 5,400) ; Selling and Distribution Overhead incurred Rs. 3,200 (Recovered Rs. 3,000) ; Sales Rs. 81,200.

Solution :

COST LEDGER

Dr.   **Stores Ledger Control A/c**   Cr.

	Rs.		Rs.
1-1-89		31-12-89	
To Balance b/f	10,000	By Work-in-Progress Control A/c	32,000
31-12-89		31-12-89	
To Cost Ledger Control A/c	35,000	By Balance c/d	13,000
	45,000		45,000
1-1-90			
To Balance b/d	13,000		

Note : Materials issued = Rs. (10,000+35,000−13,000) = Rs. 32,000.

Dr.   **Wages Control Account**   Cr.

	Rs.		Rs.
31-12-89		31-12-89	
To Cost Ledger Control A/c	20,000	By Work-in-Progress Control A/c	16,000
		,, Factory Overhead Control A/c	4,000
	20,000		20,000

Dr.   **Factory Overhead Control Account**   Cr.

	Rs.		Rs.
3-12-89		31-12-89	
To Cost Ledger Control A/c	11,000	By Work-in-Progress Control A/c	14,000
,, Wages Control A/c	4,000	,, Costing Profit & Loss A/c	1,000
	15,000		15,000

Dr.   **Work-in-Progress Control Account**   Cr.

	Rs.		Rs.
1-1-89		31-12-89	
To Balance b/f	6,000	By Finished Goods Control A/c	60,000
31-12-89		,, Balance c/d	8,000
To Stores Ledger Control A/c	32,000		
,, Wages Control A/c	16,000		
,, Factory Overhead Control A/c	14,000		
	68,000		68,000
1-1-90			
To Balance b/d	8,000		

Dr.   **Administration Overhead Control Account**   Cr.

	Rs.		Rs.
31-12-89		31-12-89	
To Cost Ledger Control A/c	5,000	By Finished Goods Control A/c	5,400
,, Costing Profit & Loss A/c	400		
	5,400		5,400

Dr.   **Selling & Distribution Overhead Control Account**   *Cr.*

31-21-89	Rs.	31-12-89	Rs.
To Cost Ledger Control A/c	3,200	By Cost of Sales A/c	3,000
		., Costing Profit & Loss A/c	200
	3,200		3,200

Dr.   **Finished Goods Control Account**   *Cr.*

1-1-89	Rs.	31-12-89	Rs.
To Balance b/f	12,000	By Cost of Sales A/c	62,400
31-12-89		,, Balance c/d	15,000
To Work-in-Progress Control A/c	60,000		
.. Administration Overhead Control A/c	5,400		
	77,400		77,400
1-1-90			
To Balance b/d	15,000		

Dr.   **Cost of Sales Account**   *Cr.*

31-12-89	Rs.	31-12-89	Rs.
To Finished Goods Control A/c	62,400	By Costing Profit & Loss A/c	65,400
„ Selling & Distribution Overhead Control A/c	3,000		
	65,400		65,400

Costing Profit & Loss Account

Dr.   *for the year ended 31.12.89*   *Cr.*

	Rs.		Rs.
To Cost of Sales A/c	65,400	By Administration Overhead Control A/c	400
.. Factory Overhead Control A/c	1,000	., Cost Ledger Control A/c (Sales)	81,200
.. Selling & Distribution Overhead Control A/c	200		
,. Cost Ledger Control A/c (Profit)	15,000		
	81,600		81,600

Dr.   **Cost Ledger Control Account**   *Cr.*

31-12-89	Rs.	1-1-89	Rs.
To Costing Profit & Loss A/c (Sales)	81,200	By Balance b/f	28,000
.. Balance c/d	36,000	31-12-89	
		By Stores Ledger Control A/c	35,000
		., Wages Control A/c	20,000
		., Factory Overhead Control A/c	11,000
		,, Adm. Overhead Control A/c	5,000
		., Selling & Distribution Overhead Control A/c	3,200
		., Costing Profit & Loss A/c	15,000
	1,17,200		1,17,200
		1-1-90	
		By Balance b/d	36,000

Note :   Total of opening debit balances equals the opening credit balance of Cost
Ledger Control A/c and total of closing debit balances equals the closing
credit balance of Cost Ledger Control A/c.

Trial Balance as on 31.12.89

	Dr. Rs.	Cr. Rs.
Stores Ledger Control A/c	13,000	
Work-in-Progress Control A/c	8,000	
Finished Goods Control A/c	15,000	
Cost Ledger Control A/c		36,000
	36,000	36,000

Problem 5.

From the following information gathered from the cost records of an
industrial unit prepare—

(i) Work-in-Progress Account, (ii) Cost of Sales Account, and (iii)
Costing Profit and Loss Account.

	Rs.	Rs.
Opening Balances :		
Work-in-Progress	7,600	
Materials	44,000	
Finished Stock	34,000	85,600
Materials purchased		1,16,000
Direct Wages		42,400
Electricity Charges		40,000
Factory Overhead Expenses incurred		54,000
Factory Overhead Expenses applied to production		52,000
Selling, Distribution and Administration Expenses		56,000
Selling, Distribution and Administration		
Expenses charged to finished stock sold		58,000
Sales		3,72,000
Closing Balances :		
Work-in-Progress	5,000	
Materials	30,000	
Finished Stock	64,000	99,000

Solution :

Dr.   **Work-in-Progress Account**   *Cr.*

	Rs.		Rs.
To Balance b/f	7,600	By Finished Stock A/c	
,, Stores Ledger Control A/c		—cost of goods produced	2.67.000
—materials used'	1,30,000	(*balancing figure*)	
,, Wages A/c	42,400	,, Balance c/f	5,000
,, Cost Ledger Control A/c			
—electricity charges	40,000		
,, Factory Overheads A/c			
—applied to production	52,000		
	2,72,000		2,72,000

Dr.   **Cost of Sales Account**   **Cr.**

	Rs.		Rs.
To Finished Stock A/c	2,37,000	By Costing Profit & Loss A/c —transfer	2,95,000
,, Selling, Distribution and Administration Expenses A/c	58,000		
	2,95,000		2,95,000

Dr.   **Costing Profit & Loss Account**   **Cr.**

	Rs.		Rs.
To Cost of Sales A/c	2,95,000	By Sales	3,72,000
,, Factory Overheads A/c —under absorption	2,000	,, Selling, Distribution and Administration Expenses A/c —over-absorption	2,000
,, Cost Ledger Control A/c —profit	77,000		
	3,74,000		3,74,000

Working Notes :

¹Materials used :   **Rs.**

Opening stock of materials	44,000
Add : Purchases	1,16,000
	1,60,000
Less : Closing stock of materials	30,000
	1,30,000

²Cost of goods sold :

Opening stock of finished goods	34,000
Add : Cost of goods produced	2,67,000
	3,01,000
Less : Closing stock of finished goods	64,000
Amount transferred to Cost of Sales A/c	2,37,000

³Over/under absorption of overheads :

	Factory overheads Rs.	Selling, Dist. & Adm. overheads Rs.
Expenses incurred	54,000	56,000
Expenses charged	52,000	58,000
Under (−) or Over (+) absorption	(−) 2,000	(+) 2,000

Problem 6.

From the following details obtained from financial accounts and cost accounts of Good Luck Ltd., prepare necessary accounts in Cost Ledger and draw a Trial Balance as at 31.12.89.

Financial Records—

Dr.		Trading A/c *for the year ended 31.12.89*		Cr.
	Rs.			Rs.
To Opening Stock :		By Sales		1,05,000
Raw Materials	6,000	,, Closing Stock :		
Work-in-Progress	5,000	Raw Materials		5,000
Finished goods	10,000	Work-in-Progress		7,000
,, Purchases	40,000	Finished Goods		9,000
,, Wages	16,000			
,, Manufacturing Expenses	14,000			
,, Gross Profit	35,000			
	1,26,000			1,26,000

Cost Records—

(i) Work-in-Progress on 1.1.89 Rs. 5,000 and on 31.12.89 Rs. 7,000.

(ii) Materials charged to Work-in-Progress Rs. 39,500.

(iii) Wages charged to Work-in-Progress Rs. 13,500.

(iv) Overhead recovered @ 120% of direct wages.

(v) Principles applied for valuation of stock are the same in both financial accounts and cost accounts.

(vi) Over- or under- absorbed overhead is carried forward to the next period.

Solution :

Dr.		Stores Ledger Control Account		Cr.
1-1-89	Rs.	31-12-89		Rs.
To Balance b/f	6,000	By Work-in-Progress Ledger		
31-12-89		Control A/c		39,500
To Cost Ledger Control A/c	40,000	,, Works Overhead Control A/c		
		(*balancing figure*)		1,500
		,, Balance c/f		5,000
	46,000			46,000

Dr.		Wages Control Account		Cr.
31-12-89	Rs.	31-12-89		Rs.
To Cost Ledger Control A/c	16,000	By Work-in-Progress Ledger		
		Control A/c		13,500
		,, Works Overhead Control A/c		2,500
	16,000			16,000

Dr.		Works Overhead Control Account		Cr.
31-12-89	Rs.	31-12-89		Rs.
To Cost Ledger Control A/c	14,000	By Work-in-Progress Ledger		
,, Stores Ledger Control A/c	1,500	Control A/c (120% of		
,, Wages Control A/c	2,500	Rs. 13,500)		16,200
		,, Balance c/f		1,800
	18,000			18,000

Dr.   **Work-in-Progress Ledger Control Account**   **Cr.**

1-1-89	Rs.	31-12-89	Rs.
To Balance b/f	5,000	By Finished Goods Control A/c	67,200
31-12-89		(*balancing figure*)	
To Stores Ledger Control A/c	39,500	,, Balance c/f	7,000
,, Wages Control A/c	13,500		
,, Works Overhead Control A/c	16,200		
	74,200		74,200

Dr.   **Finished Goods Control Account**   **Cr.**

1-1-89	Rs.	31-12-89	Rs.
To Balance b/f	10,000	By Cost of Sales A/c	68,200
,, Work-in-Progress Ledger		(*balancing figure*)	
Control A/c	67,200	,, Balance c/f	9,000
	77,200		77,200

Dr.   **Cost of Sales Account**   **Cr.**

31-12-89	Rs.	31-12-89	Rs.
To Finished Goods Control A/c	68,200	By Costing Profit & Loss A/c	68,200
	68,200		68,200

Costing Profit & Loss Account

Dr.   *for the year ending 31.12.89*   **Cr.**

	Rs.		Rs.
To Cost of Sales A/c	68,200	By Cost Ledger Control A/c	
,, Cost Ledger Control A/c		(Sales)	1,05,000
(profit)	36,800		
	1,05,000		1,05,000

Dr.   **Cost Ledger Control Account**   **Cr.**

31-12-89	Rs.	1-1-89	Rs.
To Costing Profit & Loss A/c		By Balance b/f	21,000
(Sales)	1,05,000	31-12-89	
31-12-89		By Stores Ledger Control A/c	40,000
To Balance c/f	22,800	,, Wages Control A/c	16,000
		,, Works Overhead Control A/c	14,000
		,, Costing Profit & Loss A/c	36,800
	1,27,800		1,27,800

[*Note* : Profit as per Trading. A/c differs from profit as per Costing Profit & Loss A/c owing to unrecovered Works Overhead amounting to Rs. 1,800 carried forward to the next year.]

Trial Balance as on 31.12.89

	Dr. Rs.	Cr. Rs.
Stores Ledger Control A/c	5,000	
Work-in-Progress Control A/c	7,000	
Finished Goods Control A/c	9,000	
Works Overhead Control A/c	1,800	
Cost Ledger Control A/c		22,800
	22,800	22,800

Problem 7.

Cost ledger of a company shows the following balances as on January 1, 1990 :

	Rs.	Rs.
Work-in-Progress A/c	7,840	
Finished Stock A/c	5,860	
Works Overhead A/c	400	
Office and Administration Overhead A/c	200	
Stores Ledger Control A/c	10,500	
General Ledger Adjustment A/c		24,800
	24,800 •	24,800

Transactions for the year, 1990 were :	Rs.
Wages—direct labour	62,200
Wages—indirect labour	2,800
Works overhead allocated to production	18,700
Office and administration overhead allocated	6,300
Stores issued to production	39,300
Goods finished during the year	1,20,000
Cost of finished goods sold	1,28,000
Stores purchased	36,000
Stores issued to factory repair orders	1,500
Carriage inward on stores	600
Works expenses	14,000
Office and administration expenses	6,000
Abnormal loss of stores	1,000
Normal idle time	1,000
Sales	1,60,000

You are required to :

(a) Write cost ledger accounts recording the above transactions and make necessary transfers to control accounts ; and (b) Prepare a schedule of Balances as on 31st December, 1990, explaining what each balance represents.

Solution :

COST LEDGER

Dr.		General Ledger Adjustment Account		Cr.

31-12-90	Rs.	1-1-90	Rs.
To Costing P/L A/c—sales	1,60,000	By Balance b/f	24,800
,, Balance c/d	17,400	31-12-90	
		By Stores Ledger Control A/c	
		(36,000 + 600)	36,600
		,, Wages Control A/c	
		(62,200 + 2,800)	65,000
		,, Works Overhead Control A/c	14,000
		,, Office and Administration	
		Overhead Control A/c	6,000
		,, Costing P/L A/c—net profit	31,000
	1,77,400		1,77,400
		1-1-91	
		By Balance b/d	17,400

Dr.		Stores Ledger Control Account		Cr.

1-1-90	Rs.	31-12-90	Rs.
To Balance b/f	10,500	By Work-in-Progress Control A/c	
13-12-90		—issued to production	39,300
To General Ledger		,, Works Overhead Control A/c	
Adjustment A/c	36,600	— issued to factory repair	1,500
		,, Costing P/L A/c—abnormal	
		loss	1,000
		,, Balance c/d	5,300
	47,100		47,100
1-1-91			
To Balance b/d	5,300		

Dr.		Wages Control Account		Cr.

31-12-90	Rs.	31-12-90	Rs.
To General Ledger Adj A/c	65,000	By Work-in-Progress Control A/c	
		(62,200—1,000)	61,200
		,, Works Overhead Control A/c	
		—indirect wages	2,800
		,, Works Overhead A/c	
		—normal idle time	1,000
	65,000		65,000

Dr.		Works Overhead Control Account		Cr.

1-1-90	Rs.	31-12-81	Rs.
To Balance b/f	400	By Work-in-Progress	
31-12-90		Control A/c	18,700
To General Ledger Adj. A/c	14,000	,, Balance c/d	1,000
,, Stores Ledger Control A/c			
—repairs	1,500		
,, Wages Control A/c			
—indirect wages	2,800		
,, Wages Control A/c			
—normal idle time	1,000		
	19,700		19,700
1-1-91			
To Balance b/d	1,000		

Dr.		Work-in-Progress Control Account		Cr.
1-1-90	Rs.	**31-12-90**		Rs.
To Balance b/f	7,840	By Finished Stock Control A/c		
31-12-90		—goods finished		1,20,000
To Stores Ledger Control A/c	39,300	,, Balance c/d		7,040
,, Wages Control A/c	61,200			
,, Works Overhead Control A/c	18,700			
	1,27,040			1,27,040
1-1-91				
To Balance b/d	7,040			

Dr.	Office and Administration Overhead Control Account		Cr.
1-1-90	Rs.	**31-12-90**	Rs.
To Balance b/f	200	By Finished Stock Control A/c	6,300
31-12-90			
To General Ledger			
Adjustment A/c	6,000		
,, Balance c,d	100		
	6,300		6,300
		1-1-91	
		By Balance b d	100

Dr.		Finished Stock Control Account		Cr.
1-1-90	Rs.	**31-12-90**		Rs.
To Balance b/f	5,860	By Cost of Sales A/c		
31-12-90		goods sold		1,28,000
To Work-in Progress Control A/c	1,20,000	,, Balance c/d		4,160
,, Office & Adm. Overhead				
Control A/c	6,300			
	1,32,160			1,32,160
1-1-91				
To Balance b/d	4,160			

Dr.	Cost of Sales Account		Cr.
31-12-90	Rs.	**31-12-90**	Rs.
To Finished Stock A/c	1,28,000	By Costing Profit & Loss A/c	1,28 000
	1,28,000		1,28,000

Costing Profit & Loss Account

Dr.	*for the year ended 31.12.90*		Cr.
31-12-90	Rs.	**31-12-90**	Rs.
To Cost of Sales A/c	1,28,000	By General Ledger Adjustment	
,, Stores Ledger Control A/c	1,000	A/c—sales	1,60,000
,, General Ledger Adjustment			
A/c—net profit	31,000		
	1,60,000		1,60,000

Trial Balance *as at 31.12.90*	Dr.	Cr.
	Rs.	Rs.
Work-in-Progress Control A/c	7,040	
Finished Stock Control A/c	4,160	
Works Overhead Control A/c	1,000	
Office and Administration Overhead Control A/c		100
Stores Ledger Control A/c	5,300	
General Ledger Adjustment A/c		17,400
	17,500	17,500

Explanation of the balances

The balances shown in the above Trial Balance represent in the case of :

(a) *Work-in-Progress Control Account* : The work-in-progress (i.e., partly finished jobs) valued at cost of production shown by the individual accounts in the job ledger.

(b) *Finished Stock Control Account* : The finished goods in hand, valued at cost of production, as revealed by the individual accounts in the stock ledger.

(c) *Stores Ledger Control Account* : The total cost of materials on hand as shown by the balances on the individual accounts in the Stores Ledger.

(d) *Works Overhead Control Account* : The amount of under-absorbed works overhead.

(e) *Office and Administration Overhead Control Account* : The amount of over-absorbed office and administration overhead.

(f) *General Ledger Adjustment Account* : The total of all the balances in the Cost Ledger. This account is the control account linking the Cost Ledger with the financial books.

Problem 8.

The following balances are extracted from a company's cost ledger as at 1st August :

	Rs.	Rs.
Raw Materials Control A/c	50,836	
Work-in-Progress Control A/c	12,745	
Finished Stock Control A/c	25,980	
Nominal Ledger Control A/c		89,561
	89,561	89,561

Further transactions took place during the following quarter as follows :

	Rs.
Factory overhead, allocated to work-in-progress	11,786
Goods finished (at cost)	36,834
Raw materials purchased	22,422
Direct wages, allocated to work-in-progress	8,370

	Rs.
Raw materials issued to production	16,290
Cost of goods sold	41,389
Raw materials credited by suppliers	836
Customers' returns (at cost) of finished stock	2,856
Inventory audit—raw material losses	1,236
Work-in-progress rejected (with no scrap value)	1,764

You are required to :

(a) Write up the four accounts in the cost ledger :
(b) Schedule the remaining balances.

Solution :

Dr.   **Nominal Ledger Control Account**   *Cr.*

	Rs.		Rs.
To Raw Materials Control A/c		By Balance b/f	89,561
—materials returned	836	,, Work-in-Progress Control A/c	
,, Raw Materials Control A/c		—factory overhead allocated	11,786
—materials losses	1,236	,, Work-in-Progress Control A/c	
,, Work-in-Progress Control		—direct wages allocated	8,370
A/c—work rejected	1,764	,, Raw Materials Control A/c	
,, Cost of Sales A/c	41,389	—materials purchased	22,422
,, Balance c/f	89,770	,, Finished Stock Control A/c	
		—customers' returns	2,856
	1,34,995		1,34,995

Dr.   **Raw Materials Control Account**   *Cr.*

	Rs.		Rs.
To Balance b/f	50,836	By Work-in-Progress Control A/c	
,, Nominal Ledger Control A/c		materials issued	16,290
—materials purchased	22,422	,, Nominal Ledger Control A/c	
		—material returned	836
		,, Nominal Ledger Control A/c	
		—materials losses	1,236
		,, Balance c/f	54,896
	73,258		73,258

Dr.   **Work-in-Progress Control Account**   *Cr.*

	Rs.		Rs.
To Balance c/f	12,745	By Finished Stock Control A/c	
,, Nominal Ledger Control A/c		—goods finished	36,834
—factory overhead	11,786	,, Nominal Ledger Control A/c	
,, Raw Materials Control A/c		—work rejected	1,764
—materials issued	16,290	,, Balance c/f	10,593
,, Nominal Ledger Control A/c			
—direct wages	8,370		
	49,191		49,191

Dr. **Finished Stock Control Account** *Cr.*

	Rs.		Rs.
To Balance b/f	25,980	By Cost of Sales A/c	41,389
,, Work-in-Progress Control A/c		,, Balance c/f	24,281
—goods finished	36,834		
,, Nominal Ledger Control A/c			
—customers' returns	2,856		
	65,670		65,670

Trial Balance as at......... | **Dr.** | **Cr.**

		Rs.	Rs.
Raw Materials Control A/c	..	54,896	
Work-in-Progress Control A/c	...	10,593	
Finished Stock Control A/c	...	24,281	
Nominal Ledger Control A/c	...		89,770
		89,770	89,770

SECTION II

RECONCILIATION OF COST AND FINANCIAL ACCOUNTS

In case of Integral (or Integrated) Accounts system no separate Cost Accounts and Financial Accounts are maintained. So, in this case, the necessity of reconciling Cost Accounts with Financial Accounts does not arise. Where along with Financial Accounting system there is a separate Cost Accounting system, cost accounts are required to be reconciled with financial accounts.

To understand why difference may arise necessitating reconciliation, let us consider the items that appear in the cost Ledger Control A/c (i.e., General or Nominal Ledger Adjustment A/c) in Cost Books.

The items on the debit side are :

(a) Return of materials to suppliers—The figure is the same in both cost records and financial records.

(b) Capital Order – It represents cost of capital work done. If the Financial Books record the work at cost, there will be no difference.

(c) Sales —This figure comes in the Cost Books from Financial Books. So there will be no difference.

(d) Closing Balance—This represents the value of closing materials, work-in-progress and finished goods. If both the books follow the same principles of valuation, there will be no difference, otherwise difference may arise.

(e) Loss during the period—This is ascertained from Profit & Loss A/c in Financial Books and is credited to Memorandum Cost Ledger Control A/c.

The items on the credit side are :

(a) Opening balance—This represents the value of opening materials, work-in-progress and finished goods. If same principles of valuation are followed in both the books, there will be no difference, otherwise difference may arise.

(b) Materials Purchased
(c) Materials purchased specially for particular job or jobs.
(d) Expenses incidental to purchase
(e) Wages paid
(f) Direct expenses paid
(g) Works overhead expenses incurred
(h) Administration overhead expenses incurred
(i) Selling & distribution overhead incurred

Figures for all these items from (b) to (i) are obtained from Financial Books through Memorandum Cost Ledger Control A/c. So, no difference will arise for these items.

(j) Profit during the period—This is ascertained through Profit & Loss A/c in Financial Books and is debited to memorandum Cost Ledger Control A/c.

Now let us enumerate the items which cause or may cause difference between Financial Accounts and Cost Accounts necessitating reconciliation.

(a) Opening and closing balances

(b) Capital order

(c) Profit or Loss for the period

(d) Over- or under-absorption of overheads carried forward to the next period.

(e) Purely financial items i.e., items considered in Financial Books but not in Cost Books.

(f) Items considered in Cost Books but not in Financial Books.

Items (e) and (f) of the above list requires further clarification.

The following are purely financial charges—

(i) Capital loss and expenses relating to assessment of such loss.

(ii) Stamp Duty and expenses in connection with issue and transfer of sharess, bonds etc.

(iii) Losses on investments.

(vi) Discount on issue of Debentures etc.

(v) Fines and penalties

(vi) Interest on bank loan, mortgage etc.

(vii) Charities chargeable against profit.

The following are purely financial incomes—

(i) Rent receivable (unless such rent is received from subletting business premises, because in that case rent paid less rent received is considered in Cost Accounts.)

(ii) Capital Profits.

(iii) Fees received for issue and transfer of shares etc.

(iv) Interest received from bank deposit, advance etc.

(v) Dividends received.

The following appropriations appear in Profit and Loss Appropriation Account in Financial Books, but not in Cost Books ·

(i) Income Tax, (ii) Dividends paid, (iii) Transfer of Profit to Sinking Fund for redemption of liabilities, (iv) Transfer to Reserves, (v) Goodwill written off.

These items of appropriation, however, shall not affect reconciliation between profit as per Profit & Loss Account in financial Books and profit as per Costing Profit & Loss Account.

The following are the items considered only in Cost Accounts :

These items are quite a few in number. All expenses incurred, whether for cash or on credit, appear in Financial Books. The *notional* items may only appear in cost Accounts exclusively. These are—

(a) Interest on own capital—Such interest is never actually incurred, but is considered for the purpose of ascertaining cost. If the capital would have been employed in outside investment some interest would have been earned. This interest is often regarded as an item of cost.

(b) Rent of own building—Often rent of own building is considered as an item of cost in order to facilitate the comparison of the cost of production of a factory having own building with that of a factory occupying building on rent.

Profit or loss as per Financial Accounts may be reconciled with that as per Cost Accounts either through a Memorandum Reconciliation Account or through a Reconciliation Statement, the latter being exactly in the form of a Bank Reconciliation Statement.

If the reconciliation statement starts with *Profit as per Cost Accounts* the following items are to be added ·

(i) Over recovery of overheads, (ii) Items of income not recorded in cost accounts (i.e., interest on bank deposit, dividends received etc.), (iii) Difference in the value of stocks in the two sets of books *when it under-states the profit as per Cost Accounts*, (iv) Expenses charged in Cost Accounts only (i.e., notional expenses).

The following items are deducted .

(i) Under recovery of overheads, (ii) Expenses charged in Financial Accounts only, (iii) Difference in the value of stocks in the two sets of books *when it overstates the profit as per Cost Accounts*, (iv) Appropriations.*

The ultimate figure shall represent the profit as per Financial Accounts, (A negative ultimate figure represents loss as per Financial Accounts).

[*Appropriations mentioned in (iv) of the second group are to be deducted, if reconciliation with financial profit after appropriation is aimed at.]

[*Note :* If the reconciliation statement starts with *Loss* as per Cost Accounts, the items of the first group shown above are to be deducted and those of the second group are to be added. The ultimate figure will represent *Loss* as per Financial Accounts. A negative ultimate figure however will represent *Profit* as per Financial Accounts.]

In a Memorandum Reconciliation Account *profit* as per Cost Accounts is shown on the credit side and *loss* is shown on the debit side (if the account is started with the profit/loss as per Cost Accounts). Items of the first group are *credited* and items of the second group are *debited*. Now, *credit balance* represents *profit* as per Financial Accounts and *debit balance* represents *loss* as per Financial Accounts.

WORKED-OUT PROBLEMS

Problem 1.

The following information has been obtained from the records of a manufacturer of inverters :

(a)	Materials per machine	Rs.	750
	Wages per machine	Rs.	450
	Number of machines manufactured and sold	Rs.	80
	Sale price per machine	Rs.	2,500

(b) Works overhead to be charged at 60% of the wages.

(c) Office overhead to be charged at 20% of works cost.

(d) There were no stocks of machines or work-in-progress at the beginning or at the end of the period.

Prepare a statement showing the profit per machine sold. Also prepare a statement showing the actual profit. Works expenses were Rs. 21,500 and office expenses were Rs. 24,000 as per the financial records.

You are also required to reconcile the profit as shown by the costing records with that shown by the financial records.

Solution :

Output : 80 units   Statement of Cost   Period...... .....

		Total Rs.	Per unit Rs.
Materials consumed	...	60,000	750
Wages	...	36,000	450
Prime Cost	...	96,000	1,200
Works Expenses @ 60% of wages	...	21,600	270
Works Cost	...	1,17,600	1,470
Office Expenses @ 20% of works cost	...	23,520	294
Total Cost	...	1,41,120	1,764
Profit (*balancing figure*)	...	58,880	736
Sale Price	...	2,00,000	2,500

Profit and Loss Account *for the period ended.........*

Dr.   (Financial Books)   Cr.

	Rs.		Rs.
To Materials	60,000	By Sales	2,00,000
,, Wages	36,000		
,, Works expenses	21,500		
,, Office expenses	24,000		
,, Net profit	58,500		
	2,00,000		2,00,000

Reconciliation Statement

		Rs.
Profit as per costing records	...	58,880
Add : Over-recovery of works expenses (21,600~21,500)	...	100
		58,980
Less : Under-recovery of office expenses (23,520~24,000)	...	480
Profit as financial records	...	58,500

Problem 2.

In a factory works overhead are absorbed @ 60 of labour and office expenses @ 20% of works cost. The total expenditure is as follows :

	Rs.
Materials	80,000
Labour	60,000
Factory expenses	39,200
Office expenses	34,000
	2,13,200

10% of the output is in the stock and total sales amount to Rs. 2,04,000. Prepare a cost sheet and a reconciliation statement.

Solution :

Cost Sheet *for the period*.........

		Rs.
Materials	...	80,000
Labour	...	60,000
Prime Cost	...	1,40,000
Factory expenses @ 60% of labour	..	36,000
Works Cost	...	1,76,000
Office expenses @ 20% of works cost	...	35,200
Total Cost	...	2,11,200
Less : Closing stock (10% of Rs. 2,11,200)	...	21,120
Cost of Goods Sold	...	1,90,080
Profit (*balancing figure*)	...	13,920
Sale Price	...	2,04,000

Profit and Loss Account *for the period ended*.........

Dr.	(Financial Books)		Cr.

	Rs.		Rs.
To Materials	80,000	By Sales	2,04,000
„ Labour	60,000		
„ Factory expenses	39,200		
	1,79,200		
Less : Closing Stock (10% of 1,79,200)	17,920		
Cost of goods sold	1,61,280		
„ Office expenses	34,000		
	1,95,280		
„ Net Profit	8,720		
	2,04,000		2,04,000

Reconciliation Statement

			Rs.
Profit as per costing records		...	13,920
Add : Over-recovery of office expenses (35,200~34,000)		...	1,200
			15,120
Less : Under-recovery of factory expenses (36,000~39,200)	3,200		
Difference in stock valuation (21,120~17,920)	3,200		
			6,400
Profit as per financial records		...	8,720

Problem 3.

In a factory two types of refrigerators are being manufactured, viz., "Janata" and "Aristo" models. From the following particulars prepare a statement showing cost per refrigerator and profit per refrigerato · sold. There is no opening or closing stock.

	"Janata" Rs.	"Aristo" Rs.
Labour	46,800	62,920
Materials	81,900	1,08,680

Works overhead is charged at 80% on labour and office overhead is taken at 15% on works cost.

234 "Janata" model refrigerators were sold during the period at Rs. 1,000 each and 286 "Aristo" model refrigerators were sold during the period at Rs. 1,100 each. Ascertain the total profit as per costing records from the above particulars. Assuming that the actual expenses during the period were : Factory Exp. Rs. 87,000 and Office Exp. Rs. 58,600, reconcile the profit as per costing books with that as per financial books.

Solution :

Statement of Cost and Profit

Period............

Particulars	Janata (234 units)		Aristo (286 units)		Total
	Total	Per unit	Total	Per uni	Total
	Rs.	Rs	Rs	Rs.	Rs.
Materials	81,900	350	1,08,680	380	1,90,580
Labour	46,800	200	62,920	220	1,09,720
Prime Cost	1,28,700	550	1,71,600	600	3,00,300
Works overhead (80% on labour)	37,440	160	50,336	176	87,776
Works Cost	1,66,140	710	2,21,936	776	3,88,076
Office overhead (15% on works cost)	24,921	107	33,290	116	58,211
Total Cost	1,91,061	817	2,55,226	892	4,46,287
Profit	42,939	183	59,374	208	1,02,313
Selling Price	2,34,000	1,000	3,14,600	1,100	5,48,600

Profit and Loss Account *for the period ended.........*

Dr. (Financial Books) *Cr.*

	Rs.		Rs.
To Materials	1,90,580	By Sales	5,48,600
,, Labour	1,09,720		
,, Works expenses	87,000		
,, Office expenses	58,600		
,, Net profit	1,02,700		
	5,48,600		5,48,600

Reconciliation Statement

		Rs.
Profit as per costing records	..	1,02,313
Add: Over-recovery of works overhead (87,776 – 87,000)	.	776
		1,03,089
Less: Under-recovery of office overhead (58,211 – 58,600)	.	389
Profit as per financial records	..	1,02,700

Problem 4.

A company's Trading and Profit and Loss Account was as follows :

	Rs.		Rs.
Purchases	25,210	Sales : 50,000 units at	
Less Closing stock	4,080	Rs. 1·50 each	75,000
	21,130	Discount received	260
Direct Wages	10,500	Profit on sale of land	2,340
Works expenses	12,130		
Selling expenses	7,100		
Administration expenses	5,340		
Depreciation	1,100		
Net profit	20,300		
	77,600		77,600

The cost profit, however, was only Rs. 19,770. Reconcile the financial and cost profits, using the following further information :

(a) In cost account, value of closing stock : Rs. 4,280

(b) The works expenses in the cost accounts were taken as 100% of direct wages.

(c) Selling and administration expenses were charged in the cost accounts at 10% of sales and Re. 0·10 per unit respectively.

(d) Depreciation in the cost accounts was Rs. 800.

Reconciliation Statement

	Rs.	Rs.
Profit as per Cost Accounts ...		19,770
Add : Selling expenses over recovered (7,500~7,100) ...	400	
Discounts received (purely financial income) ...	260	
Profit on sale of land (—do—) ...	2,340	
		3,000
		22,770
Less : Defference in stock valuation (4,280~4,080) ...	200	
Works expenses under recovered (10,500~12,130) ...	1,630	
Administration expenses under recovered (5,000~5,340) ...	340	
Depreciation undercharged (800~1,100) ...	300	
		2,470
Profit as per Financial Accounts ...		20,300

Problem 5.

A company furnishes the following Trading and Profit and Loss Account for the year ended 31st December, 1989 :

	Rs.			Rs.
Raw Materials	1,20,400	Sales (10,000 units)		4,00,000
Direct Wages	74,600	Finished Stock (300 units)		12,000
Production Overheads	37,540	Work-in-progress		
Administration Overheads	32,200	Materials	20,300	
Selling and Distribution Overhead	35,400	Wages	9,500	
Bad Debt written off	2,600	Production		
Preliminary Expenses written off	2,800	Overheads	6,700	
Goodwill written of	3,700			36,500
Dividend (net)	4,000	Interest on Securities		
Income-tax	6,200	(gross)		7,000
Net profit (after appropriation)	1,36,060			
	4,55,500			4,55,500

The company manufactures a standard unit. Scrutiny of cost records for the same period show that :

(*a*) Factory overheads have been allocated to production at 20% on prime cost.

(*b*) Administration overheads have been charged at Rs. 3 per unit produced.

(*c*) Selling and Distribution overheads have been charged at Rs. 4 per unit sold.

You are required to prepare a statement to find out profit as per cost accounts and to reconcile the same with that as per financial accounts.

Statement of Cost and Profit

Output : 10,300 units   **Period : year ended 31st Dec. '89**

				Rs.
Materials consumed			...	1,20,400
Direct wages			...	74.600
Prime Cost			...	1,95,000
Factory overheads @ 20% of prime cost			...	39,000
				2,34 000
Less : Closing work-in-progress :				
Materials		20,300		
Wages		9,500		
Production overheads		6,700		
				36,500
Works Cost			...	1,97,500
Administration overheads @ Rs. 3 per unit on 10,300 units produced			..	30,900
Cost of Production			...	2,28,400
Less : Cost of production of 300 units in stock : $\frac{300}{10,300} \times 2,28,400$			..	6,652
Cost of goods sold (10,000 units)			...	2 21,748
Selling and distribution expenses @ Rs. 4 per unit on 10,000 units sold			...	40,000
Cost of Sales			...	2,61,748
Profit (*balancing figure*)			...	1,38 252
Sales			...	4,00,000

Note :   1.   No. of units produced = No. of units sold + No. of units in closing stock. There is no opening stock.

Memorandum Reconciliation Account

	Rs.		Rs.
To Under-recovery :		By Profit as per Cost Statement	1 38,252
. Administration overhead		,, Over-recovery :	
(32,200 − 30,900)	1,300	Production overhead	
,, Purely Financial charges		(39,000 − 37,540)	1,460
Bad debts	2,600	Selling & Dist. Overhead	
Preliminary expenses	2,800	(40,000 − 35,400)	4,600
Goodwill	3.700	, Over-valuation of closing	
,, Appropriation :		. tock in financial accounts	
Dividend	4,000	(12,000 − 6,652)	5,348
Income-tax	6,200	,, Interest on securities (shown	
,, Balance being profit (after		in financial books only)	7,000
appropriation) as per			
Financial Accounts	1,36,060		
	1,56,660		1,56,660

Problem 6.

The following details have been ascertained from Financial and Cost Accounts :

	Cost Accounts Rs.	*Financial Accounts* Rs.
(a) Opening Stock :		
Materials	4,000	5,400
Finished goods	7,300	6,700
(b) Closing Stock :		
Materials	9,000	10,100
Finished goods	12,000	11,800

(c) Interest charged in Cost Accounts, but not actually paid Rs. 6,500.

   (d) Items written off in Financial Accounts :

Preliminary Expenses	Rs.	750
Goodwill	Rs.	1,250

   (e) Dividend from Company shares received Rs.   900

   (f) Overhead paid Rs. 35,600, but recovered Rs. 33,900

Find out profit as per Cost Accounts, assuming that profit as per Financial Accounts is Rs. 89,670.

Solution :

Memorandum Reconciliation Account

	Rs.		Rs.
Difference in opening stock of finished goods understating profit as per Cost Accounts	600	Profit as per Financial Accounts	89,670
Difference in closing stock of materials understating profit as per Cost Accounts	1,100	Difference in opening stock of materials overstating profit as per Cost Accounts	1,400
Interest charged in Cost Accounts only	6,500	Difference in closing stock of finished goods overstating profit as per Cost Accounts	200
Dividend credited in Financial Accounts only	900	Preliminary Expenses written off	750
Profit as per Cost Accounts (*balancing figure*)	85,870	Goodwill written off	1,250
		Overhead under-recovered	1,700
	94,970		94,970

Note : See the alternative treatment of difference in stock valuation in the next problem.

Problem 7.

Trading and Profit & Loss Account

Dr.   *for the year ended 31-12-89*   Cr.

	Rs.		Rs.
To Opening Stock	1,200	By Sales	52,000
,, Purchases	17,200	,, Closing Stock	2,100
,, Direct Wages	8,000	,, Dividend	600
,, Factory Overhead	7,500		
,, Office Overhead	6,000		
,, Selling Overhead	200		
,, Loss on sale of machinery	300		
,, Preliminary expenses written off	500		
,, Net profit	13,800		
	54,700		54,700

Prepare a Reconciliation Statement after considering the following information available from cost books :

   (i)   Opening Stock Rs. 1,900 ; Closing Stock Rs. 1,500.

  (ii) Factory overhead charged at 90% of Direct Wages.

 (iii) Office overhead charged Rs. 7,200.

 (iv) Selling overhead ignored.

  (v) Profit Rs. 12,000.   *(C. U., B. Com. Pass)*

Solution :

Reconciliation Statement

		Rs.	Rs.
Profit as per cost accounts	...		12,000
Add : Dividend (not shown in cost accounts)	..	600	
Office overhead over-absorbed (7,200 ~ 6,000)	...	1,200	
Difference in stock valuation[1]	...	1,300	
			3,100
			15,100
Less : Factory Overhead under-absorbed (7,200 ~ 7,500)	..	300	
Selling overhead (not shown in cost accounts)	...	200	
Loss on sale of machinery (not shown in cost accounts)	..	300	
Preliminary expenses written off (not shown in cost accounts)	...	500	
			1,300
Profit as per financial accounts	...		13,800

Working Notes :

The difference in stock valuation has been calculated as follows :

	Rs.
Financial accounts :	
Opening stock	1,200
Closing stock	2,100
Increase	900
Cost accounts :	
Opening stock	1,900
Closing stock	1,500
Decrease	400
Net difference (900 + 400)	
understating the profit in cost accounts	1,300

Problem 8.

A company operates a financial accounting system and a cost accounting system. Extracts from both financial accounts and cost accounts for the year are shown below. You are required to prepare a reconciliation statement or account.

The final financial accounts included the following :

	Rs.
Debenture interest	20,000
Interest received	10,000
Discount allowed	24,000
Discount received	9,000
Net profit	5,70,000

Stock valuations	Opening Rs.	Closing Rs.
Raw materials	1,52,000	1,98,000
Work-in-progress	66,000	72,000
Finished goods	84,000	87,000

The final cost accounts included the following :

	Rs.
Interest on capital	90,000
Notional rent	60,000
Administration overhead over-absorbed	20,000
Production overhead under-absorbed	25,000
Selling and distribution overhead over-absorbed	24,000

Stock valuations	*Opening*	*Closing*
	Rs.	Rs.
Raw materials	1,64,000	1,87,000
Work-in-progress	61,000	68,000
Finished goods	90,000	94,000

Solution :

Reconciliation Statement

	Rs.	Rs.
Profit as per financial accounts		5,70,000
Add : Debenture interest (not shown in cost accounts)	20,000	
Discount allowed (not shown in cost accounts)	24,000	
Administration overhead over-absorbed	20,000	
Selling and distribution overhead over-absorbed	24,000	
		88,000
		6,58,000
Less : Interest received (not shown in cost accounts)	10,000	
Discount received (not shown in cost accounts)	9,000	
Interest on capital (not shown in financial accounts)	90,000	
Notional rent (not shown in financial accounts)	60,000	
Production overhead under-absorbed	25,000	
Difference in stock valuation (55,000 — 34,000)	21,000	
		2,15,000
Profit as per cost accounts		4,43,000

Working Note :

The difference in stock valuation has been calculated as follows :

Financial accounts—	Rs.
Opening stock (1,52,000 + 66,000 + 84,000)	3,02,000
Closing stock (1,98,000 + 72,000 + 87,000)	3,57,000
Increase	55,000

Cost accounts—	
Opening stock (1,64,000 + 61,000 + 90,000)	3,15,000
Closing stock (1,87,000 + 68,000 + 94,000)	3,49,000
Increase	34,000

∴ Rs. 55,000 — Rs. 34,000 or Rs. 21,000 is the amount by which a profit in financial book was overstated.

Problem 9.

The following differences have been observed in Cost Accounts and Financial Accounts.

	Cost Accounts Rs.	Financial Accounts Rs.
Opening Stock :		
Raw Materials	18,700	18,350
Work-in-Progress	7,200	7,500
Finished Goods	9,600	9,280
Closing Stock :		
Raw Materials	14,650	14,730
Work-in-Progress	8,140	8,260
Finished Goods	10,420	10,170
Factory Overhead	38,740	39,000
Administration Overhead	13,400	12,800
Selling & Distribution Overhead	9,700	10,000
Interest on own capital	2,000	nil
Dividend received	nil	2,500
Goodwill written off	nil	10,000
Bad debt written off	500	2,500

Profit shown by the Cost Accounts Rs. 8,120

Prepare a Memorandum Reconciliation Account showing the profit or loss as per Financial Accounts.

Solution :

Memorandum Reconciliation Account

	Rs.		Rs.
Under-recovery of Factory Overhead	260	Profit as per Cost Accounts	8,120
Under-recovery of Selling and Distribution Overhead	300	Difference in stock valuation (2,290--1,970)[1]	320
Interest on Capital	2,000	Over-recovery of Administration Overhead	600
Goodwill written off	10,000	Dividend Received	2,500
Under-recovery of Bad Debt	2,000	Loss as per Financial Accounts (*balancing figure*)	3,020
	14,560		14,560

Working Note :
[1]The difference in stock valuation has been calculated as follows :

Cost accounts—	Rs.
Opening stock (18,700+7,200+9,600)	35,500
Closing stock (14,650+8,140+10,420)	33,210
Decrease	2,290

Financial accounts—	
Opening stock (18,350+7,500+9,280)	35,130
Closing stock (14,730+8,260+10,170)	33,160
Decrease	1,970

Problem 10.

The Profit and Loss Account of Lindwal Ltd. for the year ended on 31st December, 1989 was as follows :

Dr.   *Cr.*

		Rs.		Rs.
To Raw Materials			By Cost of Goods Manufactured	
Opening Stock	25,000		c/d	3,11,500
Purchases	1,35,000			
	1,60,000			
Less : Closing Stock	28,000			
		1,32,000		
,, Wages—direct		1,15,000		
Prime Cost		2,47,000		
,, Works Overhead :				
Indirect wages	30,000			
Power	20,000			
Rent & Rates	10,500			
Lighting	2,500			
Depreciation	5,000			
Sundry Expenses	1,000			
		69,000		
Gross Works Cost		3,16,000		
,, Deduct work-in-progress				
Closing Stock	23,600			
Less : Opening Stock	19,100			
		4,500		
		3,11,500		3,11,500
To Finished goods :			By Sales	4,25,000
Opening Stock	21,600			
Goods Manufactured				
b/d	3,11,500			
	3,33,100			
Less : Closing Stock	23,100			
		3,10,000		
,, Gross Profit c/d		1,15,000		
		4,25,000		4,25,000
To Office Salaries		18,000	By Gross Profit b/d	1,15,000
,, Salesmen's Salaries		12,000	,, Dividend Received	1,300
,, Selling Expenses		8,200	,, Interest on Bank deposit	2,200
,, Distribution Expenses		4,300		
,, Loss on Sale of Plant		1,600		
,, Fines		1,300		
,, Interest on Mortgage		400		
,, Net Profit c/d		72,700		
		1,18,500		1,18,500
To Income Tax		32,100	By Net Profit b/d	72,700
,, General Reserve A/c		5,000		
,, Dividend A/c		20,000		
,, Goodwill written off		1,600		
,, Balance c/f		14,000		
		72,700		72,700

The Cost Accounts showed a profit of Rs. 97,700. Stocks had been valued as follows :

Raw Materials—Opening Rs. 24,800 ; Closing Rs. 28,750.

Work-in-Progress— Opening Rs. 19,250 ; Closing Rs. 23,500.

Selling and Distribution expenses had been ignored in Cost Accounts. Prepare a Reconciliation Account.

Solution :

Memorandum Reconciliation Account

Items not credited in Cost Accounts :		Rs.		Rs.
Dividend Received	1,300		Profit as per Financial Accounts	72,700
Interest on Bank			Items not charged in Cost Accounts :	
Deposit	2,200		Loss on Sale of Plant 1,600	
		3,500	Fines 1,300	
Profit as per Cost Accounts			Interest on Mortgage 400	
(balancing figure)		97,700	Salesmen's Salaries 12,000	
			Selling Expenses 8,200	
			Distribution Expenses 4,300	
			Difference in the value of stock	27,800
			overstating profit as per Cost	
			Accounts (8,200 − 7,500)[1]	700
		1,01,200		1 01,200

Working Note :

> [1] The difference in stock valuation has been calculated as follows :

	Rs.
Financial accounts—	
Opening stock (25,000 + 19,100)	44,100
Closing stock (28,000 + 23,600)	51,600
Increase	7,500
Cost accounts—	
Opening stock (24,800 + 19,250)	44,050
Closing stock (28,750 + 23,500)	52,250
Increase	8,200

Problem 11.

From the following Profit & Loss Account of Navjyot Ltd. for the year ended 31st December, 1989 and the additional information supplied, prepare a Cost Sheet, ascertain the profit or loss as per Cost Records and reconcile such profit or loss with profit shown by the Profit & Loss Account.

Profit & Loss Account

Dr.   *for the year ended 31st December, 1989*   Cr.

	Rs.		Rs.
To Opening Stock of Finished Goods (800 units @ Rs. 20)	16,000	By Sale of Finished Goods (20,300 units @ Rs. 30)	6 09,000
,, Materials (consumed)	2,00,000	,, Closing Stock of Finished Goods (500 units @ Rs. 20)	10,000
,, Direct Wages	1,30,000	,, Dividends Received	2,600
,, Indirect Wages :		,, Bank Interest Received	400
Factory	20,300		
Office (Administration)	11,200		
Sales Office	7,400		
,, Repairs :			
Factory	2,700		
Office (Administration)	400		
,, Lighting :			
Factory	1,500		
Office (Administration)	600		
Sales Office	800		
,, Power & Fuel	6,300		
,, Depreciation :			
Plant	8,700		
Office Furniture	1,200		
Advertising Equipment	500		
,, Audit Fees	2,500		
,, Director's Remuneration	10,000		
,, Show Room Expenses	2,800		
,, Packing Expenses	4,600		
,, Bad debts	2,000		
,, Advertisement	4,500		
,, Freight on Delivery	2,100		
,, Goodwill written off	700		
,, Preliminary Exp. written off	200		
,, Net Profit	1,85,000		
	6,22,000		6,22,000

Information received from Cost Records :

     Opening Finished Goods were valued @ Rs. 22·00 per unit.

     Materials consumed per unit of output Rs. 10·00.

     Direct Wages per unit of output Rs. 6·50.

     Factory Overhead recovered @ Rs. 2·00 per unit produced.

     Administration Overhead recovered @ Rs. 1·25 per unit produced.

     Selling and Distribution overhead recovered @ Rs. 1·10 per unit sold.

     Bad debt has not been considered in Cost Accounts.

Solution :

Cost Sheet

(Output : 20,000 units)

		Rs.
Materials Consumed @ Rs. 10·00	...	2,00,000
Wages @ Rs. 6·50	...	1,30,000
Prime Cost	...	3,30,000
Overhead @ Rs. 2 on 20,000 units	...	40,000
Factory Cost	...	3,70,000
Administration Overhead @ Rs. 1·25 on 20,000 units	...	25,000
Cost of Production	...	3,95,000
Add : Opening Finished Stock 800 units @ Rs. 22	...	17,600
		4,12,600
Less : Closing Finished Stock $\left[\dfrac{Rs.\ 3,95,000}{20,000} \times 500\right]$	...	9,875
Cost of goods sold	.	4,02,725
Selling & Distribution Overhead @ Rs. 1·10 on 20,300 units	.	22,330
Total Cost	.	4,25,055
Sales	...	6,09,000
Profit	...	1,83,945

Working Notes :

     (a)   Units Produced = Sales units + Closing stock units — Opening stock units

                   = 20,300 + 500 — 800

                   = 20,000 units.

     (b)   *Analysis of Expenses Paid —*

Expenses	Factory Overhead Rs.	Administration Overhead Rs.	Selling & Distribution Overhead Rs.
Indirect Wages	20,300	11,200	7,400
Repairs	2,700	400	—
Lighting	1,500	600	800
Power & Fuel	6,300	—	..
Depreciation	8,700	1,200	500
Audit Fees	—	2,500	—
Directors' Remuneration	—	10,000	—
Show Room Expenses	—	—	2,800
Packing Expenses	—	—	4,600
Advertisement	—	—	4,500
Freight on Delivery	—	—	2,100
Bad Debt	—	—	2,000
	39,500	25,900	24,700

(c) Difference in stock valuation :

	Financial accounts Rs.	Cost accounts Rs.
Opening Stock	16,000	17,600
Closing Stock	10,000	9,875
Decrease	6,000	7,725

(d) Over-recovery of Factory Overhead : (40,000 – 39,500) = Rs. 500.

(e) Under-recovery of Administration Overhead : (25,900 – 25,000) = Rs. 900.

(f) Under-recovery of Selling and Distribution overhead (which includes bad debt) : (24,700 – 22,330) = Rs. 2.370.

Reconciliation Statement

		Rs.	Rs.
	Profit as per Cost Accounts		1,83,945
Add :	Difference in stock valuation (7,725 – 6,000)	1,725	
,,	Over-recovery of Factory Overhead	500	
,,	Dividends Received	2,600	
,,	Bank Interest Received	400	
			5,225
			1,89,170
Less :	Under-recovery of Administration Overhead	900	
,,	Under-recovery of Selling and Distribution Overhead	2,370	
,,	Preliminary Expenses written off	200	
,,	Goodwill written off	700	
			4,170
	Profit as per Financial Accounts		1,85,000

Problem 12.

You are supplied—(i) an extract of Profit & Loss Account and (ii) a Cost Sheet. Reconcile the profit as per Financial Accounts with that as per Cost Accounts.

(i) Profit & Loss Account

Dr.   *for the year ended 31st December, 1989*   Cr.

	Rs.		Rs.
To Opening Stock of Materials	6,000	By Sales (930 units @ Rs. 180)	1,67,400
,, Purchase of Materials	57,000	,, Closing Stock of Materials	3,000
,, Opening Stock of Finished		,, Closing Stock of Finished	
Products (80 units @ Rs. 120)	9,600	Products (100 units @ 125)	12,500
,, Wages—direct	40,000	,, Machinery Account (value	
,, Administration Expenses	20,000	of 50 Machine tools trans-	
,, Factory Expenses	10,000	ferred @ Rs. 140)	7,000
,, Sales & Distribution Expenses	4,600	,, Interest Received	1,000
,, Discount on Debentures			
written off	1,200		
,, Profit c/d	42,500		
	1,90,900		1,90,900
,, Income Tax	18,300	By Profit from previous year b/f	9,500
,, Dividend	15,000	,, Profit b/f	42,500
,, Balance c/f	18,700		
	52,000		52,000

(ii) Cost Sheet

Period—1989   **Output :   1,000 light machine tools**

	Rs.
Direct Materials	60,000
Direct Wages	40,000
Prime Cost	1,00,000
Factory Overhead @ 55% of Direct Wages	22,000
Works Cost	1,22,000
Administration Overhead @ 8% of Works Cost	9,760
Cost of Production	1,31,760
Add : Opening Stock of Finished goods 80 units @ Rs. 123	9,840
	1,41,600
Less Closing Stock of Finished goods $\left[\dfrac{100 \times \text{Rs. } 1,31,760}{1,000}\right]$	13,176
	1,28,424
Less . Value of 50 units transferred to Machinery account $\left[\dfrac{50 \times \text{Rs. } 1,31,760}{1,000}\right]$	6,588
	1,21,836
Add : Sales & Distribution Expenses @ 5 per unit on 930 units sold	4,650
Cost of Sales	1,26,486
Sales 930 units @ Rs. 180	1,67,400
Profit	40,914

Solution :

Memorandum Reconciliation Account

	Rs.		Rs.
Under-recovery Administration Overhead	240	Profit as per Cost Accounts	40,914
Difference in stock valuation (3,336—2,900)	436	Over-recovery of Factory Overhead	2,000
Discount on Debentures written off	1,200	Difference in the value of capital work understating the profit as per Cost Accounts	
Profit as per Financial Accounts	42,500	(7,000 – 6,588)	412
		Over-recovery of Sales and Distribution Overhead	50
		Interest Received	1,000
	44,376		44,376

Working Note :

'The difference in stock valuation has been calculated as follows :

Financial accounts—	Rs.
Opening stock of finished goods	9,600
Closing stock of finished goods	12,500
Increase	2,900

Cost accounts—	
Opening stock of finished goods	9,840
Closing stock of finished goods	13,176
Increase	3,336

Problem 13.

The following is a summary of the Trading and Profit and Loss Account of PB Ltd., for the year ending December 31st, 1989 :

	Rs.			Rs.
Materials consumed	68,500	Sales (60,000 units		1,50,000
Wages	37,750	Finished stock		
Factory expenses	20,750	(2,000 units)		4,000
Administration expenses	9,560	Work-in-Progress :		
Selling and Distribution		Materials	1,600	
expenses	11,250	Wages	900	
Preliminary expenses w/o	1,000	Factory expenses	500	
Goodwill w o	500			3,000
Net profit	8,140	Dividends		450
	1,57,450			1,57,450

The company manufactures a standard unit.

In the Cost Accounts factory expenses have been allocated to production at 20% of prime cost, administration expenses at 15 p. per unit and selling and distribution expenses at 20 p. per unit. The net profit shown by the Cost Accounts was Rs. 8,200.

Prepare :

(*a*) Various control accounts including those for factory expenses, administration expenses and selling and distribution expenses ;

(*b*) A statement reconciling the profit disclosed by the cost records with that shown in the financial accounts.

Dr.	Factory Expenses Control Account			*Cr.*
31-12-89	Rs.	31-12-89		Rs.
To General Ledger Adjus. ent A/c	20,750	By Work-in-Progress Control A/c - 20% of prime cost		21,250
„ Balance c/f	500			
	21,250			21,250

Dr.	Administration Overhead Control Account			*Cr.*
31-12-89	Rs.	31-12-89		Rs.
To General Ledger Adjustment A/c	9,560	By Cost of Sales A/c —62,000 units @ Re. 0·15		9,300
		„ Balance c/f		260
	9,560			9,560

Dr.	Selling and Distribution Overhead Control Account			*Cr.*
31-12-89	Rs.	31-12-89		Rs.
To General Ledger Adjustment A/c	11,250	By Cost of Sales A/c —60,000 units @ Re. 0·20		12,000
„ Balance c/f	750			
	12,000			12,000

Dr. **Work-in-Progress Control Account** Cr.

31-12-89	Rs.	31-12-89	Rs.
To Stores Ledger Control A/c	68,500	By Finished Goods Control A/c	1,24,500
„ Wages Control A/c	37,750	„ Balance c/f	3,000
„ Factory Expenses Control A/c	21,250		
	1,27,500		1,27,500

Dr. **Finished Goods Control Account** Cr.

31-12-89	Rs.	31-12-89	Rs.
To Work-in-Progress Control A/c	1,24,500	By Cost of Sales A/c	1,20,500
		„ Balance c/f 200 units	4,000
	1,24,500		1,24,500

Dr. **Cost of Sales Account** Cr.

31-12-89	Rs.	31-12-89	Rs.
To Finished Goods Control A/c	1,20,500	By Costing P/L A/c	1,41,800
„ Administration Overhead Control A/c	9,300		
„ Selling & Distribution Overhead Control A/c	12,000		
	1,41,800		1,41,800

Costing Profit and Loss Account

Dr. *for the year ending 31-12-89* Cr

	Rs.		Rs.
To Cost of Sales A/c	1,41,800	By General Ledger Adjustment A/c- sales	1,50,000
„ General Ledger Adjustment A/c—Profit for the year	8,200		
	1,50.000		1,50,000

Note : [1]Assumed that over- and under-recovered overheads have been carried forward to the next year.

Memorandum Reconciliation of Cost and Financial Accounts

		Rs.		Rs.
To Administration overhead Under-recovered		260	By Profit as per Cost Books	8,200
„ Items not charged in Cost Accounts :			„ Factory Overhead over-recovered	500
Preliminary expenses	1,000		„ Selling and Distribution Overhead over-recovered	750
Goodwill	500		„ Income not included in Cost Books—dividends	450
		1,500		
„ Profit as per Financial Accounts		8,140		
		9.900		9,900

Problem 14.

The following is the summarised Trading and Profit & Loss Account of Lindwal Ltd. for the year ended 31.12.89.

	Rs.			Rs.
To Direct Materials	73,800	By Sales (43,000 units @ Rs. 5)		2,15,000
„ Direct Wages	46,000	, Finished Stock (2,000 units		
., Production overhead	21,000	@ Rs. 4)		8,000
„ Administration overhead	10,200	., Work-in-Progress :		
„ Selling & Distribution		Materials	1,800	
overhead	12,400	Wages	1,000	
„ Preliminary Expenses		Production Overhead	1,000	
written off	2,000			3,800
.. Goodwill written off	1,500	.. Dividend Received (gross)		2,700
„ Dividend (Net)	3,000	„ Bank Interest		500
, Income Tax	6,000			
„ Net Profit	54,100			
	2,30,000			2,30,000

The company manufactures a standard product.

In Cost Accounts Production Overhead has been recovered at 50% of direct wages ; Administration overhead has been recovered @ 25 paise per unit and Selling and Distribution Overhead has been recovered @ 20 paise per unit sold. The net profit shown by the Cost Accounts was Rs. 62,850.

Prepare Control Accounts for Overhead Expenses only and a Memorandum Reconciliation Account reconciling the net profit as per Cost Accounts with that as per Financial Accounts.

Solution .

Dr. **Production Overhead Control Account** *Cr.*

31-12-89	Rs.	31-12-89	Rs.
To Cost Ledger Control A/c	21,000	By Work-in-Progress Control	
„ Balance c/f (over-recovery)	2,000	A/c (50% of Rs. 46,000)	23,000
	23,000		23,000

Dr. **Administration Overhead Control Account** *Cr.*

31-12-89	Rs.	31-12-89	Rs.
To Cost Ledger Control A/c	10,200	By Finished Goods Control A/c	
.. Balance c/f (over-recovery)	1,050	(¼ × 45,000)	11,250
	11,250		11,250

Dr. **Selling & Distribution Overhead Control Account** *Cr.*

31-12-89	Rs.	31-12-89	Rs.
To Cost Ledger Control A/c	12,400	By Cost of Sales A/c	
		(⅕ × 43,000)	8,600
		.. Balance c/f (under-recovery)	3,800
	12,400		12,400

Working Notes :

Value of Finished Stock as per Cost Accounts (componentwise) :	Rs.
Materials $\dfrac{73,800-1,800}{45,000} \times 2,000$	3,200
Wages $\dfrac{46,000-1,000}{45,000} \times 2,000$	2,000
Production Overhead @ 50% of direct wages (i.e., 50% of Rs. 2,000)	1,000
Administration Overhead @ 25 paise per unit on 2,000 units	500
	6,700

∴ Difference in stock valuation understating profit as per Cost Accounts
     –(Rs. 8,000 – Rs. 6,700) = Rs. 1,300.

Memorandum Reconciliation Account

	Rs.			Rs.
To Under-recovery of Overhead .		By Profit as per Cost Accounts		62,850
„ Selling & Distribution	3,800	„ Dividend Received (gross)		2,700
„ Preliminary Expenses		„ Bank Interest		500
written off	2,000	„ Over-recovery of Overhead :		
„ Goodwill written off	1,500	Production	2,000	
„ Dividends Paid	3,000	Administration	1,050	
„ Income Tax	6,000			3,050
„ Net Profit as per Financial		„ Difference in Stock Valuation		
A/cs	54,100	of Finished Stock		1,300
	70,400			70,400

Problem 15.

P.K. Industries Ltd. maintains its Cost Accounts on double entry system. The Cost Control Accounts show the following balances :

	As on 1-4-89	As on 31-3-90
	Rs.	Rs.
Materials Control Account	10,000	5,000
Work-in-Progress Control Account	15,000	14,000
Finished Goods Control Account	25,000	40,000

The transactions during the year 1989-90 were as under :

	Rs.	Rs.
Total materials purchased		80,000
Total wages paid– Direct	40,000	
—Indirect	10,000	50,000
Indirect expenses incurred :		
Depreciation	15,000	
Power and Fuel	25,000	
Sundry Expenses	40,000	80,000
Loss on sale of Capital Assets		1,000
Abnormal loss		4,000
Interest		5,000
Direct Materials consumed on Jobs		60,000
Indirect Materials consumed		25,000
Overhead expenses recovered from Jobs		1,10,000
Sales		2,50,000

Show :

(a) All the control accounts including those for Work-in-Progress, Finished Goods and also Cost of Sales Account ; (b) Profit and Loss Account ; and (c) Cost and Financial Profit and Loss Reconciliation.

Solution :

Dr.	General Ledger Adjustment Account		Cr.
31-3-9)	Rs.	**1-4-59**	Rs.
To Costing P/L A/c		By Balance b/f	50,000
—Sales	2,50,000	(10,000 + 15,000 + 25,000)	
,. Balance c/f		**31-3-90**	
(5,000 + 14,000 + 40,000)	59,000	By Materials Control A/c	80,000
		., Wages Control A/c	50,000
		.. Overhead Control A/c	80,000
		. Costing P/L A/c	
		—Net profit	49,000
	3,09,000		3,09,000

Dr.	Materials Control Account		Cr.
1-4-89	Rs.	**31-3-90**	Rs.
To Balance b/f	10,000	By Work-in-Progress A/c	
31-3-90		issues of materials	60,000
To Genl. Ledg. Adj. A/c		,, Overhead Control A/c	25,000
—Purchases	80,000	,, Balance c/f	5,000
	90,000		90,000

Dr.	Wages Control Account		Cr.
31-3-90	Rs.	**31-3-90**	Rs.
To Genl Ledg. Adj. A/c		By Work-in-Progress A/c	40,000
—wages paid	50,000	., Overhead Control A/c	10,000
	50,000		50,000

Dr.	Overhead Control Account			Cr.
31-3-90		Rs.	**31-3-90**	Rs.
To Genl. Ledg. Adj. A/c			By Work-in-Progress A/c	
—Depreciation	15,000		– overhead charged to	
—Power & Fuel	25,000		production	1,10,000
—Sundry Expenses	40,000		,, Balance c/d	
		80,000	– under-recovery'	5,000
,, Materials Control A/c		25,000		
,, Wages Control A/c		10,000		
		1,15,000		1,15,000

Dr.   **Work-in-Progress Control Account**   *Cr.*

	Rs.		Rs.
1-4-89		31-3-90	
To Balance b/f	15,000	By Finished Stock Control A/c	2,11,000
31-3-90		,, Balance c/f	14,000
To Materials Control A/c	60,000		
,, Wages Control A/c	40,000		
,, Overhead Control A/c	1,10,000		
	2,25,000		2,25,000

Note : 'Under-recovered overhead has been written off to Costing P/L A/c.

Dr.   **Finished Stock Control Account**   *Cr.*

	Rs.		Rs.
1-4-89		31-3-90	
To Balance b/f	25,000	By Cost of Sales A/c	1,96,000
31-3-90		,, Balance c/f	40,000
To Work-in-Progress Control A/c			
—transfer	2,11,000		
	2,36,000		2,36,000

Dr.   **Cost of Sales Account**   *Cr.*

	Rs.		Rs.
31-3-90		31-3-90	
To Finished Stock Control A/c		By Costing P/L A/c	1,96,000
— transfer	1,96,000		
	1,96,000		1,96,000

Dr.   **Costing Profit & Loss Account**   *Cr.*

	Rs.		Rs.
31-3-90		31-3-90	
To Cost Sales A/c		By Genl. Ledg. Adj. A/c	
—transfer	1,96,000	—sales	2,50,000
,, Overhead Control A/c			
- under-recovery	5,000		
,, Genl. Ledg. Adj. A/c			
—net profit	49,000		
	2,50,000		2,50,000

Profit & Loss Account (in Financial Books)

Dr.   *for the year ended 31-3-90*   *Cr.*

	Rs.		Rs.
To Opening Stock :		By Sales	2,50,000
Materials	10,000	,, Closing Stock :	
Work-in-Progress	15,000	Materials	5,000
Finished Goods	25,000	Work-in-Progress	14,000
,, Materials purchased	80,000	Finished Goods	40,000
,, Wages	50,000		
,, Depreciation	15,000		
,, Power & Fuel	25,000		
,, Sundry Expenses	40,000		
,. Loss on Capital Asset	1,000		
,, Abnormal Loss	4,000		
,, Interest	5,000		
,, Net Profit	39,000		
	3,09,000		3,09,000

Memorandum Reconciliation of Cost and Financial Accounts

as at 31.3.90

	Rs.		Rs.
To Items not included in cost A|cs :		By Profit as per Cost Books	49,000
Loss on sale of			
Capital Assets	1,000		
Abnormal Loss	4.000		
Interest	5.000		
	10,000		
,. Profit as per Financial Books	39,000		
	49,000		49,000

SECTION III

INTEGRAL OR INTEGRATED ACCOUNTS

We have seen that when Cost Accounts are maintained separately from Financial Accounts the necessity of reconciling the profit or loss shown by the two sets of books arises. To do away with such necessity, an accounting system has been introduced which is known as *Integral* or *Integrated Account System.*

As the name implies, transactions of financial and costing characters are all recorded in one integrated set of books. The integrated set of books shall, therefore, record the basic transactions of both Financial and Cost Accounts. Let it be illustrated through examples.

Example I

Wages amounting to Rs. 10,000 are paid.

    (a) **In Financial Books it will be recorded as below :**

        Wages A/c   Dr. Rs. 10,000

           To Cash   Rs. 10,000

Cost Ledger Control (Memorandum) Account shall also be debited with Rs. 10,000.

    (b) **In Cost Books it will be recorded as below :**

        Wages Control A/c   Dr. Rs. 10,000

           To Cost Ledger Control A/c   Rs. 10,000

              (or General Ledger Adjustment A/c)

    (c) **In Integrated Accounting System it will be recorded as below :**

        Wages Control A/c   Dr. Rs. 10,000

           To Cash   Rs. 10,000

Thus, in integrated accounting system the essential points (i.e., Wages and Cash in this case) in each transaction are recorded.

Example II.

Materials amounting to Rs. 20,000 are purchased on credit.

    (a) **In Financial Books it will be recorded as below :**

        Purchase A/c   Dr. Rs. 20,000

           To Suppliers A/c   Rs. 20,000

Cost Ledger Control (Memorandum) Account shall also be debited with Rs. 20,000.

(b)   In Cost Books it will be recorded as below :

Stores Ledger Control A/c   Dr.   Rs. 20,000

   To Cost Ledger Control A/c   Rs. 20,000

      (or General Ledger Adjustment A/c)

(c)   In Integrated Accounting System it will be recorded as below :

Stores Ledger Control A/c   Dr.   Rs. 20,000

   To Suppliers A/c   Rs. 20,000

Thus, in integrated accounting system, the essential points (i.e., Stores and Suppliers in this case) in the transaction are recorded.

Illustration 1.

Journalise the following transactions assuming that cost and financial transactions are integrated :

	Rs.
Raw materials purchased	2,00,000
Direct materials issued to production	1,50,000
Wages paid (30% indirect)	1,20,000
Wages charged to production	84,000
Manufacturing expenses incurred	84,000
Manufacturing overhead charged to production	92,000
Selling and distribution costs	20,000
Finished products (at cost)	2,00,000
Sales	2,90,000
Closing stock	Nil
Receipts from debtors	69.000
Payments to creditors	1,10,000

Solution :

Journal		Dr.	Cr.
		Rs.	Rs.
Stores Ledger Control A/c ... Dr.		2,00,000	
To Creditors			2,00,000
(Raw materials purchased)			
Work-in-Progress Control A/c ... Dr.		1,50,000	
To Stores Ledger Control A/c			1,50,000
(Direct materials issued to production)			
Wages Control A/c ... Dr·		1,20,000	
To Bank			1,20,000
(Wages paid)			
Work-in-Progress Control A/c (70%) ... Dr.		84,000	
Factory Overhead Control A/c (30%) ... Dr.		36,000	
To Wages Control A/c			1,20,000
(Wages allocated)			

Journal (Contd.)	Dr.	Cr.
	Rs.	Rs.
Factory Overhead Control A/c ... Dr. To Bank (Factory overheads incurred)	84,000	84,000
Work-in-Progress Control A/c ... Dr. To Overhead Control A/c (Factory Overhead charged to production)	92,000	92,000
Selling & Distribution Overhead Control A/c ... Dr. To Bank (Selling and distribution overheads incurred)	20,000	20,000
Finished Stock Ledger Control A/c ... Dr. To Work-in-Progress Control A/c (Cost of goods finished)	2,00,000	2,00,000
Cost of Sales A/c ... Dr. To Finished Stock Ledger Control A/c (Cost of finished goods sold)	2,00,000	2,00,000
Cost of Sales A/c .. Dr. To Selling & Distribution Overhead Control A/c (Selling and distribution overhead charged to cost of sales)	20,000	20,000
Sundry Debtors ... Dr. To Sales' (Finished goods sold)	2,90,000	2,90,000
Bank ... Dr. To Sundry Debtors (Receipts from debtors)	69,000	69,000
Sundry Creditors ... Dr. To Bank (Payments made to creditors)	1,10,000	1,10,000

[*Note* : Sales Account is debited and Cost of Sales A/c is credited with the cost of sales. For the profit, Sales A/c is debited and Profit & Loss A/c is credited. For loss, Profit & Loss A/c is debited and Sales A/c is credited.]

The Third-Entry Method

It is also a method of integral accounting system. Under this method entries are made in the same way as described above, but in addition, *a third-entry is made in respect of elements of cost.* All items of cost in total are debited to a Cost Ledger Control Account. Then the Cost is analysed into third-entry accounts *which do not form part of double entry.* For example, wages being paid, it is debited in total to Cost Ledger Control Account and credited to cash. The wages are then analysed into Direct Wages, Indirect Factory Wages, Administrative Wages, Selling & Distribution Wages for the purpose of debiting of the third-entry accounts which are in this case, Work-in-Progress Account, Factory Overhead Account, Administration Overhead Account and Selling & Distribution Overhead Account respectively. The totals of these accounts are then transferred to

Finished Goods Account, Profit & Loss Account etc., double-entry being confined in Cost Control Account.

Since analysis of costs is obtained from Job Cards, Standing Order Cards etc., ordinary double-entry principle would be sufficient; third-entry accounts are only superfluous.

Illustration 2.

On 1.1.89 a company had the following balances in its Integrated Ledger :

	Dr. Rs.	Cr. Rs.
Share Capital Account	—	1,00,000
Fixed Assets Account	60,000	—
Debtors Control Account	15,000	—
Suppliers Control Account	—	12,000
Stores Control Account	20,000	—
Finished Goods Account	14,000	—
Work-in-Progress Account	18,000	—
Cash at Bank Account	13,000	—
Provision for Depreciation Account	—	8,000
Profit & Loss Account	—	20,000
	1,40,000	1,40,000

The following were the transactions during the year ended 31st December, 1989 :

	Rs.
Credit Purchase of Materials	1,15,000
Direct Wages paid by cheque	90,000
Indirect Wages paid by cheque	4,000
Materials issued to Production	1,15,000
Materials issued for service	3,000
Cost of goods finished during the year	2,60,000
Credit Sales during the year	3,35,000
Factory Overhead Recovered	60,000
Cost of goods sold during the year	2,68,000
Overhead Expenses paid by cheque :	
Factory	48,000
Administration	14,000
Selling & Distribution	18,000
Paid to Suppliers by cheque	1,12,000
Cheques received from Customers	3,20,000
Depreciation on Factory Assets for the year	2,500

The company writes off administration overhead to Costing Profit & Loss Account.

Write up the Accounts in Integrated Ledger and draw a Trial Balance as on 31st December, 1989.

Solution :

Dr.		Stores Control Account		Cr.
1-1-89	Rs.	31-12-89		Rs.
To Balance b/f	20,000	By Work-in-Progress A/c		1,15,000
31-12-89		,, Factory Overhead A/c		3,000
To Suppliers Control A/c	1,15,000	,, Balance c/f		17,000
	1,35,000			1,35,000

Dr.		Work-in-Progress Account		Cr.
1-1-89	Rs.	31-12-89		Rs.
To Balance b/f	18,000	By Finished Goods A/c		2,60,000
31-12-89		,, Balance c/f		23,000
To Stores Control A/c	1,15,000			
,, Wages Control A/c	90,000			
,, Factory Overhead A/c	60,000			
	2,83,000			2,83,000

Dr.		Wages Control Account		Cr.
31-12-89	Rs.	31-12-89		Rs.
To Bank (90,000 + 4,000)	94,000	By Work-in-Progress A/c		90,000
		,, Factory Overhead A/c		4,000
	94,000			94,000

Dr.		Factory Overhead Account		Cr.
31-12-89	Rs.	31-12-89		Rs.
To Bank A/c	48,000	By Work-in-Progress A/c		60,000
,, Wages Control A/c	4,000			
,, Stores Control A/c	3,000			
,, Provision for Depreciation A/c	2,500			
,, Balance c/f (over-recovery carried forward to the next year)	2,500			
	60,000			60,000

Dr.		Provision for Depreciation Account		Cr.
31-12-89	Rs.	1-1-89		Rs.
To Balance c/f	10,500	By Balance b/f		8,000
		,, Factory Overhead A/c		2,500
	10,500			10,500

Dr.		Finished Goods Account		Cr.
1-1-89	Rs.	31-12-89		Rs.
To Balance b/f	14,000	By Cost of Sales A/c		2,68,000
,, Work-in-Progress A/c	2,60,000	,, Balance c/f		6,000
	2,74,000			2,74,000

Dr.   **Cost of Sales Account**   Cr.

31-12-89	Rs.	31-12-89	Rs.
To Finished Goods A/c	2,68,000	By Sales A/c	
„ Selling & Distribution Overhead		—transfer	2,86,000
A/c	18,000		
	2,86,000		2,86,000

Dr.   **Administration Overhead Account**   Cr.

31-12-89	Rs.	31-12-89	Rs.
To Bank A/c	14,000	By Profit & Loss A/c	14,000
	14,000		14,000

Dr.   **Selling & Distribution Overhead Account**   Cr.

31-2-89	Rs.	31-12-89	Rs.
To Bank A/c	18,000	By Cost of Sales A/c	18,000
	18,000		18,000

Dr.   **Sales Account**   Cr.

31-12-89	Rs	31-12-89	Rs.
To Cost of Sales A/c (transfer)	2,86,000	By Debtors Control A/c	3 35,000
„ Profit & Loss A/c	49,000		
	3,35,000		3.35,000

Profit & Loss Account

Dr.   *for the year ended 31st December, 1984*   Cr.

	Rs.		Rs.
To Administration Overhead A/c	14,000	By Sales A/c	49,000
„ Balance c/d	35,000		
	49,000		49,000
To Balance c/f	55,000	By Last Year's Profit b/f	20,000
		„ Balance b/d	35,000
	55,000		55,000

Dr.   **Share Capital Account**   Cr.

31-12-89	Rs.	1-1-89	Rs.
To Balance c/f	1,00,000	By Balance b/f	1,00,000
	1,00,000		1,00,000

Dr.   **Debtors Control Account**   Cr.

1-1-89	Rs.	31-12-89	Rs.
To Balance b/f	15,000	By Bank A/c	3,20,000
31-12-89		„ Balance c/f	30,000
To Sales A/c	3,35,000		
	3,50,000		3,50,000

Dr.		Suppliers Control Account		Cr.
31-12-89	Rs.	1-1-89		Rs.
To Bank A/c	1,12,000	By Balance b/f		12,000
„ Balance c/f	15,000	31-12-89		
		By Stores Control A/c		1,15,000
	1,27,000			1,27,000

Dr.		Fixed Assets Account		Cr.
1-1-89	Rs.	31-12-89		Rs.
To Balance b/f	60,000	By Balance c/f		60,000
	60,000			60,000

Dr.		Bank Account		Cr.
1-1-89	Rs.	31-12-89		Rs.
To Balance b/f	13,000	By Suppliers Control A/c		1,12,000
„ Debtors Control A/c	3,20,000	„ Wages Control A/c		94,000
		„ Factory Overhead A/c		48,000
		„ Administration Overhead A/c		14,000
		„ Selling & Distribution Overhead A/c		18,000
		„ Balance c/f		47,000
	3,33,000			3,33,000

Trial Balance *as at 31st December, 1989*

	Dr. Rs.	Cr. Rs.
Share Capital Account	—	1,00,000
Fixed Assets Account	60,000	—
Debtors Control Account	30,000	—
Suppliers Control Account	—	15,000
Stores Control Account	17,000	—
Finished Goods Account	6,000	—
Work-in-Progress Account	23,000	.—
Factory Overhead Account (over-recovery)	—	2,500
Cash at Bank Account	47,000	—
Provision for Depreciation Account	—	10,500
Profit & Loss Account	—	55,000
	1,83,000	1,83,000

The above accounts have been prepared on Double Entry principle. The above problem may be worked out under *Third Entry Method* to show how the accounts under third entry method differ from those under double ·entry. Under third entry method the Overhead Accounts and Wages Control Account can be eliminated by passing the entries relating these two accounts through *Cost Control Account*. For example, the issue of direct materials to production is debited to Cost Control Account and credited to Stores Control Account and then it is debited to Work-in-Progress Account and credited to Cost Control

Account. Similar entries may be passed for *indirect materials for production to do away with Factory Overhead Account. For payment of factory overhead expenses, Cost Control Account may be debited* and *Bank Account credited.* For recovery of factory overhead, Work-in-Progress Account may be debited and Cost Control Account may be credited. To the extent of over- or under-recovery of overhead, the Cost Control Account will show a balance. For payment of wages (direct and indirect), similarly, Cost Control Account may be debited and Bank Account credited. Then Work-in-Progress Account may be debited and Cost Control Account may be credited for charging such wages to production. Thus, Work-in-Progress Account is debited for all direct and indirect costs, under third entry method, credit being given to Cost Control Account. An analysis of third entries may be prepared in the following lines :

Third Entries
for the year ended............

Elements of Cost	Production		Adminis-tration	Selling & Distribution
	Direct	Indirect		
Materials Consumed				
Wages Paid				
Overhead Paid				
Depreciation provided				
Recovered				
Over- or under-recovery carried forward	×			

Illustration 3.

Prepare the Ledger Accounts under *Third Entry Method* from the matters in Illustration 2 above.

Solution :

Dr.	Stores Control Account			Cr.
1-1-89	Rs.	31-12-89		Rs.
To Balance b/f	20,000	By Cost Control A/c :		
31-12-89		Direct Material issued	1,15,000	
To Suppliers Control A/c	1,15,000	Indirect Material issued	3,000	
				1,18,000
		,, Balance c/f		17,000
	1,35,000			1,35,000

Dr.	Work-in-Progress Account			Cr.
1-1-89	Rs.	31-12-89		Rs.
To Balance b/f	18,000	By Finished Goods A/c		2,60,000
31-12-89		,, Balance c/f		23,000
To Cost Control A/c :				
Direct Materials	1,15,000			
Direct Wages	90,000			
Factory Overhead	60,000			
	2,65,000			
	2,83,000			2,83,000

Note : ¹Factory overhead recovered is Rs. 60,000 although the factory overhead incurred is (indirect materials Rs. 3 000 + indirect wages Rs. 4,000 + factory expenses Rs. 48,000 + depreciation Rs. 2.500) or Rs. 57,500. Thus, over-recovery is Rs. 2,500.

Dr. **Provision for Depreciation Account** *Cr.*

31-12-89	Rs.	1-1-89	Rs.
To Balance c/f	10,500	By Balance b/f	8,000
		,, Cost Control A/c	2,500
	10,500		10,500

Dr. **Finished Goods Account** *Cr.*

1-1-89	Rs.	31-12-89	Rs.
To Balance b/f	14,000	By Cost of Sales A/c	2,68,000
31-12-89		,, Balance c/f	6,000
To Work-in-Progress A/c	2,60,000		
	2,74,000		2,74,000

Dr. **Cost of Sales Account** *Cr.*

31-12-89	Rs	31-12-89	Rs.
To Finished Goods A/c	2,68,000	By Sales A/c (transfer)	2,86,000
,, Cost Control A/c			
(Selling & Distribution overhead)	18,000		
	2,86,000		2,86,000

Dr. **Sales Account** *Cr.*

31-12-89	Rs.	31-12-89	Rs.
To Cost of Sales A/c	2,86,000	By Debtors Control A/c	3,35,000
,, Profit & Loss A/c	49 000		
	3,35,000		3,35,000

Profit & Loss Account
Dr. *for the year ended 31st Dec. 1989* *Cr.*

	Rs.		Rs.
To Cost Control A/c		By Sales A/c	49,000
(Administration overhead)	14,000		
,, Balance c/d	35 000		
	49,000		49,000
To Balance c/f	55,000	By Last Year's Profit b/d	20,000
		,, Balance b/f	35,000
	55,000		55,000

Dr. **Share Capital Account** *Cr.*

31-12-89	Rs.	1-1-89	Rs.
To Balance c/f	1,00,000	By Balance b/f	1,00,000
	1,00,000		1,00,000

Dr.   **Debtors Control Account**   *Cr.*

1-1-89	Rs.	31-12-89	Rs.
To Balance b/f	15,000	By Bank	3,20,000
31-12-89		„ Balance c/f	30,000
To Sales A/c	3,35,000		
	3,50,000		3,50,000

Dr.   **Suppliers Control Account**   *Cr.*

31-12-89	Rs.	1-1-89	Rs.
To Bank	1,12,000	By Balance b/f	12,000
„ Balance c/f	15,000	31-12-89	
		By Stores Control A/c	1,15,000
	1,27,000		1,27,000

Dr.   **Fixed Assets Account**   *Cr.*

1-1-89	Rs.	31-12-89	Rs.
To Balance b/f	60,000	By Balance c/f	60,000
	60,000		60,000

Dr.   **Bank Account**   *Cr.*

1-1-89	Rs.	31-12-89		Rs.
To Balance b/f	13,000	By Suppliers Control A/c		1,12,000
31-12-89		„ Cost Control A/c :		
To Debtors Control A/c	3,20,000	Wages	94,000	
		Factory Overhead	48.000	
		Admn. Overhead	14,000	
		Selling & Dist. Overhead	18.000	
				1,74,000
		„ Balance c/f		47,000
	3,33,000			3,33,000

Dr.   **Cost Control Account**   *Cr.*

31-12-89		Rs.	31-12-89		Rs.
To Stores Control A/c		1,18,000	By Work-in-Progress A/c :		
„ Provision for Depreciation		2,500	Direct Materials	1,15,000	
„ Bank :			Direct Wages	90,000	
Wages	94,000		Factory Exp. recovered	60,000	
Factory Expenses	48,000				2,65,000
Administration Exp.	14.000		„ Cost of Sales A/c (Selling &		
Selling & Dist. Exp.	18,000		Distribution Exp. recovered)		18,000
		1,74,000	„ Profit & Loss A/c (Administra-		
„ Balance c/f (Over-recovery of			tion overhead recovered)		14,000
factory overhead carried for-					
ward to next year)		2,500			
		2,97,000			2,97,000

Third Entries

for the year ended 31.12.89

Elements of Cost	Production		Adminis-tration	Selling & Distribution
	Direct	Indirect		
	Rs.	Rs.	Rs.	Rs.
Materials	1,15,000	3,000	—	—
Wages	90,000	4,000	—	..
Overhead	—	48,000	14,000	18,000
Depreciation	—	2,500	--	—
	2,05,000	57,500	14,000	18,000
Recovered	2,05,000	60,000	14,000	18,000
Over-Recovery carried forward to the next year	×	2,500	×	×

Illustration 4.

The following is the Trial Balance of Lindwal Ltd. as at 1.1.89.

	Dr.	Cr.
	Rs.	Rs.
Cash	2,000	
Debtors	16,000	
Stock :		
Raw Materials	14,000	..
Work-in-Progress	10,000	—
Finished Goods	4,000	—
Machinery and Plant	40,000	—
Buildings	9,000	—
Share Capital		70,000
General Reserve		6,000
Profit & Loss A/c		4,000
Creditors		15,000
	95,000	95,000

Transactions during the year ended 31st Dec., 1989 are as below

	Rs.
Materials purchased on credit	10,000
Materials issued :	
direct for production	9,000
to Service Deptt. *X*	800
to Service Deptt. *Y*	500
to Production Deptt.	3,700
Expenses paid in cash	400
Expenses incurred on credit	450

Expenses allocated :	Rs.
to product direct	150
to Service Deptt. *X*	200
to Service Deptt. *Y*	150
to Production Deptt.	300
to Administration and Selling	100
Wages and Salaries :	
Service Deptt. *X*	150
Service Deptt. *Y*	300
Production Deptt.	2,000
Administration and Selling	600
Deductions from Salaries :	
Provident Fund	300
E.S.I. Contribution	100
Sales—Production cost plus 20%	28,800
Cash collected from Debtors	12,000
Cash paid to Creditors	9,000

Other Information

1. Recovery of the cost of Service Deptt. *X* from Service Deptt. *Y* and the Production Deptt. in the ratio of materials consumed by them, the amount of recovery being equal to 30% of the total cost of materials used by Service Deptts. *X* and *Y* and the Production Deptt.

2. Recovery of the cost of Service Deptt. *Y* from the Production Deptt. only, the amount of recovery being equal to 40% of wages and salaries of the production deptt.

3. Recovery of the cost of Production Deptt. at the rate of Rs. 2·50 per unit produced and completed from work-in-progress.

4. Number of units of the product produced and completed at cost of Rs. 7 per unit—3,000.

5. Depreciation to be provided and charged to Production Deptt.—2% on machinery and plant and 1% on building.

You are asked to prepare the ledger accounts under integral accounting system and also Trial Balance as at 31st Dec., 1989.

Solution :

Dr.		Cash Account		Cr.
	Rs.	31-12-89		Rs.
1-1-		By Expenses A/c		400
To Balance b/f	2,000	„ Wages & Salaries Payable A/c		2,650
31-12-89		„ Creditors A/c		9,000
To Debtors A/c	12,000	„ Balance c/f		1,950
	14,000			14,000

Dr.   **Debtors Account**   **Cr.**

	Rs.		Rs.
1-1-89		31-12-89	
To Balance b/f	16,000	By Cash A/c	12,000
31-12-89		„ Balance c/f	32,800
To Sales	28,800		
	44,800		44,800

Dr.   **Stores Control Account**   **Cr.**

	Rs.		Rs.
1-1-89		31-12-89	
To Balance b/f	14,000	By Work-in-Progress	9,000
31-12-89		„ Service Deptt. X	800
To Creditors A/c	10,000	„ Service Deptt. Y	500
		„ Production Deptt.	3,700
		„ Balance c/f	10,000
	24,000		24,000

Dr.   **Work-In-Progress Account**   **Cr.**

	Rs.		Rs.
1-1-89		31-12-89	
To Balance b/f	10,000	By Finished Goods A/c ($3,000 \times 7$)	21,000
„ Stores Control A/c	9,000	„ Balance c/f	7,161
„ Production Deptt.	9,011		
„ Expenses A/c	150		
	28,161		28,161

Dr.   **Finished Goods Account**   **Cr.**

	Rs.		Rs.
1-1-89		31-12-89	
To Balance b/f	4,000	By Profit & Loss A/c—cost of goods	
31-12-89		sold ($\frac{5}{6} \times 28,800$)	24,000
To Work-in-Progress A/c ($3,000 \times 7$)	21,000	„ Balance c/f	1,000
	25,000		25,000

Dr.   **Machinery & Plant Account**   **Cr.**

	Rs.		Rs.
1-1-89		31-12-89	
To Balance b/f	40,000	By Balance c/f	40,000
	40,000		40,000

Dr.   **Building Account**   **Cr.**

	Rs.		Rs.
1-1-89		31-12-89	
To Balance b/f	9,000	By Balance c/f	9,000
	9,000		9,000

Dr.   **Creditors Account**   **Cr.**

31-12-89	Rs.	1-1-89	Rs.
To Cash A/c	9,000	By Balance b/f	15,000
„ Balance c/f	16,450	„ Stores Control A/c	10,000
		„ Expenses A/c	450
	25,450		25,450

Dr.   **Share Capital Account**   **Cr.**

31-12-89	Rs.	1-1-89	Rs.
To Balance c/f	70,000	By Balance b/f	70,000
	70,000		70,000

Dr.   **General Reserve Account**   **Cr.**

31-12-89	Rs.	1-1-89	Rs.
To Balance c/f	6,000	By Balance b/f	6,000
	6,000		6,000

Dr.   **Expenses Account**   **Cr.**

31-12-89	Rs.	31-12-89	Rs.
To Creditors A/c	450	By Work-in-Progress	150
„ Cash	400	„ Service Deptt. X	200
„ Profit & Loss A/c	50	„ Service Deptt. Y	150
		„ Production Deptt.	300
		„ Administration & Selling	100
	900		900

Dr.   **Wages & Salaries Control Account**   **Cr.**

31-1-89	Rs.	31-12-89	Rs.
To Wages and Salaries Payable A/c	3,050	By Service Deptt. X	150
		„ Service Deptt. Y	300
		„ Production Deptt.	2,000
		„ Administration & Selling	600
	3,050		3,050

Dr.   **Wages and Salaries Payable Account**   **Cr.**

31-12-89	Rs.	31-12-89	Rs.
To Provident Fund	300	By Wages & Salaries Control A/c	3,050
„ E. S. I. Contribution	100		
„ Cash A/c	2,650		
	3,050		3,050

Dr.   **Provident Fund Contribution Account**   **Cr.**

31-12-89	Rs.	31-12-89	Rs.
To Balance c/f	300	By Wages & Salaries Payable A/c	300
	300		300

Dr.   **E. S. I. Contribution Account**   *Cr.*

31-12-89	Rs.	31-12-89	Rs.
To Balance c/f	100	By Wages & Salaries Payable A/c	100
	100		100

Dr.   **Service Deptt. X Account**   *Cr.*

31-12-89	Rs.	31-12-89	Rs.
To Stores Control A/c	800	By Service Deptt. Y¹	179
„ Expenses A/c	200	„ Production Deptt.¹	1,321
„ Wages & Salaries Control A/c	150		
„ Profit & Loss A/c	350		
	1,500		1,500

Dr.   **Service Deptt. Y Account**   *Cr.*

31-12-89	Rs.	31-12-89	Rs.
To Stores Control A/c	500	By Production Deptt. A/c	800
„ Expenses A/c	150	„ Profit & Loss A/c	329
„ Wages & Salaries Control A/c	300		
„ Service Deptt. X¹	179		
	1,129		1,129

Dr.   **Production Deptt. Account**   *Cr.*

31-12-89	Rs.	31-12-89	Rs.
To Stores Control A/c	3,700	By Work-in-Progress A/c :	
„ Expenses A/c	300	Units completed (3,000 @ 2·50) 7,500	
„ Wages & Salaries Control A/c	2,000	Units not yet completed 1,511	
„ Service Deptt. X¹	1,321		9,011
„ Service Deptt. Y¹	800		
„ Depreciation on Machinery & Plant	800		
„ Depreciation on Building	90		
	9,011		9,011

Dr.   **Administration & Selling Expenses Account**   *Cr.*

31-12-89	Rs.	31-12-89	Rs.
To Expenses A/c	100	By Profit & Loss A/c	700
„ Wages & Salaries Control A/c	600		
	700		700

Dr.   **Depreciation on Machinery Account**   *Cr.*

31-12-89	Rs.	31-12-89	Rs.
To Balance c/f	800	By Production Deptt.	800
	800		800

Dr. Depreciation on Building Account **Cr.**

31-12-89	Rs.	31-12-89	Rs.
To Balance c/f	90	By Production Deptt.	90
	90		90

Profit & Loss Account

Dr. *for the year ended 31st December, 1989* **Cr.**

	Rs.		Rs.
To Finished Goods A/c	24,000	By Service Deptt. X (over-recovery)	350
„ Administration & Selling Expenses	700	„ Sales	28,800
„ Service Deptt. Y (under-recovery)	329	„ Expenses A/c (over-recovery)	50
„ Net Profit c/d	4,171		
	29,200		29,200
To Balance c/f	8,171	By Net Profit b/d	4,171
		„ Last Year's Profit	4,000
	8,171		8,171

Trial Balance as at 31.12.89

	Dr. Rs.	Cr. Rs.
Cash	1,950	—
Debtors	32,800	—
Stock :		
Raw Materials	10,000	—
Work-in-Progress	7,161	—
Finished goods	1,000	—
Machinery and Plant	40,000	—
Building	9,000	—
Share Capital	—	70,000
General Reserve	—	6,000
Depreciation on Machinery & Plant	—	800
Depreciation on Building		90
Creditors		16,450
Profit & Loss A/c		8,171
Provident Fund Contribution		300
E.S.I. Contribution		100
	1,01,911	1,01,911

Working Notes :

1. *Apportionment of Service Deptt. X cost :*

	Rs.
Materials Consumed by Deptt. X	800
„ „ „ „ Y	500
„ „ „ Production Deptt.	3,700
Total	5,000

30% of Rs. 5,000=Rs. 1,500.

This cost is allocated as below :

To Deptt. $Y \dfrac{500}{(500+3,700)} \times$ Rs. 1,500 = Rs. 179

To Prod. Deptt. $\dfrac{3,700}{(500+3,700)} \times$ Rs. 1,500 = Rs. 1,321.

2. *Apportionment of Service Deptt. Y cost :*
40% of Rs. 2,000 = Rs. 800.

'Inter-locking' and 'Integration' of cost and financial accounts

When separate financial accounts and cost accounts are maintained, they are *'inter-locked'* with the help of control accounts. Cost Ledger Control Account is maintained in the general ledger in financial books and General Ledger Adjustment Account is maintained in the cost ledger. Through these accounts the two sets of books are inter-locked. The same items appear in the above two accounts, but on opposite sides.

'Integration' means merger of the two sets of books, namely financial accounts and cost accounts. In one integrated ledger both financial accounts and cost accounts are maintained.

In case of inter-locking, i.e., where there are two separate sets of books inter-locked by control accounts, reconciliation of result shown by the two sets of books is essential. In case of integration no such reconciliation becomes necessary. Besides, integrated or integral accounting system is more economical than inter-locking system. But, in spite of the above advantages, some organisations prefer inter-locking system due to some practical difficulties experienced with integrated system.

In the earlier section of this chapter we have learnt how the control accounts are maintained for the purpose of inter-locking and also how reconciliation between the profit (or loss) as per cost accounts and that as per financial accounts, is done. In this section we have been acquainted with the integrated or integral accounting system.

We can now find out the points of distinction between Control Accounts System and Integrated Accounts System as below :

Distinction between Control Accounts System and Integrated Accounts System

The following are the points of distinction :

1. In case of Control Accounts System two separate sets of books—financial and cost, are to be maintained, while under Integrated Accounts System only one set of books has to be maintained.

2. Reconciliation between profit as per financial accounts and that as per cost accounts is necessary in case of Control Accounts System, but this is not at all necessary in case of Integrated Accounts System.

3. Control Accounts System involves more clerical work (due to maintenance of two sets of books) than it is involved in Integrated Accounts System.

4. Integrated Accounts System saves time and effort (besides saving in clerical work) while in Control Accounts System such saving cannot be achieved.

Integrated Accounts and Standard Costing

When costs are predetermined on the basis of attainable efficiency, such costs are called *Standard Costs* and the method is called *Standard Costing*. While setting standards for a particular period, definite changes in the capacity, productive efficiency etc. which can be foreseen are taken into consideration.

The main object of fixing standards for operation is to exercise control over the actual costs.

Therefore, nature of costs, their variability with the changes in operating conditions are to be clearly understood before standards are set. Standard costing is dependent upon the micro-analysis of the various components of cost, because each component of cost is to be broken down into minute parts for exercising proper control.

There are *various ways of recording standard costs in the accounts*. The method usually followed by many organisations is that, all expenses *actually incurred* are charged to the accounts concerned, but are recovered in the Work-in-Progress Account at standard. Work completed is then transferred to finished goods account at standard cost. This, in effect, means that the Work-in-Progress Account is maintained at standard cost so that any balance of the account at the end of a period shall be inevitably valued at standard cost. Finished goods at the end of the period shall also be similarly valued.

It may be noted that Standard Costing can be suitably introduced when there is integrated accounting system and records may be maintained on that basis.

Illustration 5.

From the following particulars pass the journal entries in an integral accounting system :

(a) Issued materials Rs. 3,00,000 of which Rs. 2,80,000 (standard Rs. 2,40,000) are direct materials.

(b) Net wages paid Rs. 70,000, deductions being Rs. 12,000 (standard Rs. 75,000).

(c) Gross salaries payable for the period is Rs. 26,000 (standard Rs. 25,000). Deductions Rs. 2,000.

(d) Sales (credit) Rs. 8,00,000.

(e) Discount allowed Rs. 5,000.

(f) Salaries and wages allocation : Rs. 60,000 direct (standard Rs. 62,000) and out of the balance 50% Production, 30% Administration and 20% Selling and Distribution Overheads.   (*I. C. W. A., Inter.*)

Solution :

	Journal			Dr.	Cr.
				Rs.	Rs.
(a)	Work-in-Progress A/c	...	Dr.	2,40,000	
	Works Overheads A/c	...	Dr.	20,000	
	Material Rate Variance A/c	...	Dr.	40,000	
	To Stores Ledger Control A/c				3,00,000
	(Issue of direct and indirect materials)				
(b)	Wages Control A/c	...	Dr.	75,000	
	Wages Rate Variance A/c	...	Dr.	7,000	
	To Cash A/c				70,000
	,, Creditor (Expenses) A/c				12,000
	(Payment of wages)				
(c)	Salaries Control A/c	...	Dr.	25,000	
	Pay Rates Variance A/c	...	Dr.	1,000	
	To Salaries Payable A/c				24,000
	,, Creditors (expenses) A/c				2,000
	(Salaries payable for the period)				
(d)	Debtor A/c	..	Dr.	8,00,000	
	To Sales A/c				8,00,000
	(Credit sales for the period)				
(e)	Discount Allowed A/c	..	Dr.	5,000	
	To Debtor A/c				5,000
	(Discount allowed to Debtor)				
(f)	Work-in-Progress A/c	.	Dr.	62,000	
	Works Overhead A/c	..	Dr.	20,000	
	Administration Overhead A/c	..	Dr.	12,000	
	Selling & Distribution Overhead A/c	.	Dr.	8,000	
	To Wages Control A/c				75,000
	,, Salaries Control A/c				25,000
	,, Wages Efficiency Variance A/c				2,000
	(Allocation of wages and salaries)				

Illustration 6.

The following balances have been obtained as on 1.4.83 from the integrated standard costs and financial accounts of Lindwal Ltd.

	Rs.
Share Capital Account	90,000
Creditors	26,400
Fixed Assets	42,000
Raw Materials in store and process (at standard)	24,000
Direct wages in process (,,)	6,000
Factory expenses in process (,,)	3,000
Finished stock (,,)	27,000
Debtors	30,000.
Cash at Bank	3,000
Sales (at standard)	1,75,500
Sales variance	3,600 (Dr.)
Factory Cost of Sales (at standard)	1,47,900
Material variance	1,500 (Cr.)

	Rs.
Direct Wages variance	*2,100 (Dr.)*
Factory Expenses variance	*600 (Dr.)*
Administration and Selling overhead	4,200
Transactions during April, 1983 were as below :	
Sales (at Standard)	31,500
Actual Sales	29,400
Cash collected from Debtors	28,500
Cash paid to Creditors	18,900
Direct Wages paid in cash	6,900
Raw Materials purchased (actual cost)	12,000
Excess Materials issued (at standard)	300
Factory Expenses incurred	5,100
Administration & Selling overhead incurred	900
Output Finished (at standard cost) :	
Materials	15,000
Direct Wages	7,800
Factory Expenses	3,900
Standard Factory Cost of actual sales	24,600
Standard Cost of materials purchased	12,600

Work-in-Progress Accounts are debited at actual and credited at standard. The closing balance of Work-in-Progress Account was valued at—

Direct Wages (at standard)	Rs. 4,500
Factory Expenses (at standard)	Rs. 3,900

Prepare the Ledger accounts and draw a Trial Balance as at 30th April, 1983. *(I. C. W. A.—Adapted)*

Solution :

Dr.   **Share Capital Account**   Cr.

30-4-83	Rs.	1-4-83	Rs.
To Balance c/f	90,000	By Balance b/f	90,000
	90,000		90,000

Dr.   **Creditors Account**   Cr.

30-4-83	Rs.	1-4-83	Rs.
To Bank	18,900	By Balance b/f	26,400
„ Balance c/f	25,500	30-4-83	
		By Purchases	12,000
		„ Expenses :	
		Factory	5,100
		Administration & Selling	900
	44,400		44,400

Dr.   Fixed Assets Account   *Cr.*

1-4-83 To Balance b/f	Rs. 42,000	30-4-83 By Balance c/f	Rs. 42,000
	42,000		42,000

Dr.   Raw Materials in Store and Process Account   *Cr.*

1-4-83 To Balance b/f	Rs. 24,000	30-4-83 By Finished Goods A/c (15,000 + 300)	Rs. 15,300
30-4-83 To Creditors A/c (standard cost)	12,600	„ Balance c/f	21,300
	36,600		36,600

Dr.   Direct Wages in Process Account   *Cr.*

1-4-83 To Balance b/f	Rs. 6,000	30-4-83 By Finished Goods A/c	Rs. 7,800
30-4-83 To Bank A/c	6,900	„ Wages Variance A/c (balancing figure)	600
		„ Balance c/f	4,500
	12,900		12,900

Dr.   Factory Expenses in Process Account   *Cr.*

1-4-83 To Balance b/f	Rs. 3,000	30-4-83 By Finished Goods A/c	Rs. 3,900
30-4-83 To Creditors A/c	5,100	„ Overhead Variance A/c (balancing figure)	300
		„ Balance c/f	3,900
	8,100		8,100

Dr.   Finished Stock Account   *Cr.*

1-4-83 To Balance b/f	Rs. 27,000	30-4-83 By Sales A/c	Rs. 24,600
30-4-83 To Raw Materials A/c	15,000	„ Balance c/f	29,100
„ Wages A/c	7,800		
„ Factory Expenses A/c	3,900		
	53,700		53,700

Dr.   Debtors Account   *Cr.*

1-4-83 To Balance b/f	Rs. 30,000	30-4-83 By Bank A/c	Rs. 28,500
30-4-83 To Sales A/c	29,400	„ Balance c/f	30,900
	59,400		59,400

Cost (Part I)—44

Dr. Bank Account **Cr.**

	Rs.		Rs.
1-4-83		30-4-83	
To Balance b/f	3,000	By Creditors A/c	18,900
30-4-83		,, Wages A/c	6,900
To Debtors A/c	28,500	,, Balance c/f	5,700
	31,500		31,500

Dr. Standard Sales Account **Cr.**

	Rs.		Rs.
30-4-83		1-4-83	
To Profit & Loss A/c	2,07,000	By Balance b/f	1,75,500
		30-4-83	
		By Debtors A/c	31,500
	2,07,000		2,07,000

Dr. Sales Variance Account **Cr.**

	Rs.		Rs.
1-4-83		30-4-83	
To Balance b/f	3,600	By Profit & Loss A/c	5,700
30-4-83			
To Debtors A/c			
(Standard Sales—actual sales)			
(31,500 − 29,400)	2,100		
	5,700		5,700

Dr. Cost of Sales Account **Cr.**

	Rs.		Rs.
1-4-83		30-4-83	
To Balance b/f	1,47,900	By Profit & Loss A/c	1,72,500
30-4-83			
To Finished Goods A/c	24,600		
	1,72,500		1,72,500

Dr. Material Variance Account **Cr.**

	Rs.		Rs.
30-4-83		1-4-83	
To Raw Materials A/c	300	By Balance b/f	1,500
(Standard cost of excess raw		30-4-83	
materials issued)		By Purchases A/c (Standard—Actuals)	
,, Profit & Loss A/c	1,800	(12,600 − 12,000)	600
	2,100		2,100

Dr. Direct Wages Variance Account **Cr.**

	Rs.		Rs.
1-4-83		30-4-83	
To Balance b/f	2,100	By Profit & Loss A/c	2,700
30-4-83			
To Wages A/c	600		
	2,700		2,700

Dr. **Factory Expenses Variance Account** Cr.

1-4-83	Rs.	30-4-83	Rs.
To Balance b/f	600	By Profit & Loss A/c	900
30-4-83			
To Factory Expenses A/c	300		
	900		900

Dr. **Administration & Selling Overhead Account** Cr.

1-4-83	Rs.	30-4-83	Rs.
To Balance b/f	4,200	By Profit & Loss A/c	5,100
30-4-83			
To Creditors A/c	900		
	5,100		5,100

Profit & Loss Account

Dr. *for the month ending on 30.4.83* Cr.

	Rs.		Rs.
To Cost of Sales A/c	1,72,500	By Standard Sales A/c	2,07,000
,, Sales Variance A/c	5,700	,, Material Variance A/c	1,800
,, Wages Variance A/c	2,700		
,, Factory Expense Variance A/c	900		
,, Adm. & Selling Overhead A/c	5,100		
,, Net Profit	21,900		
	2,08,800		2,08,800

Trial Balance *as at 30th April, 1983*

	Dr. Rs.	Cr. Rs.
Share Capital	—	90,000
Creditors	—	25,500
Fixed Assets	42,000	—
Finished Stock	29,100	—
Raw Materials in Store & Process	21,300	—
Wages in Process	4,500	—
Factory Expenses in Process	3,900	—
Debtors	30,900	—
Bank	5,700	—
Net profit for the period	—	21,900
	1,37,400	1,37,400

EXERCISES

Theoretical :

1. What is a Cost Ledger ? What are the Cost Control Accounts that are usually opened in such a ledger ?

2. Discuss the important Control Accounts maintained in a costing system.

(C. U., B. Com. Pass '84)

, 3. (a) State the advantages of maintaining a Cost Ledger.

(b) Insert specimen entries in the following accounts of a Cost Ledger explaining from what sources, such entries are normally obtained :

Stores Ledger Control Account, Work-in-Progress Control Account, Finished Stock Control Account, Cost of Sales Account.

4. Why is reconciliation of financial accounting and cost accounting necessary ? How are these reconciliations drawn ? (*G. U., B. Com.*)

5. What is the need for reconciliation of cost accounts and financial accounts ? Discuss the various reasons for variations.

6. Explain the causes of discrepancy between the profits disclosed by Financial Accounts and that disclosed by Cost Accounts. (*C. U., B. Com. Pass. '82*)

7. List the items, either debit or credit, which appear in financial accounts but do not appear in cost accounts.

8. A manufacturing concern prepares a costing profit and loss account which does not agree with the audited financial profit and loss account. Indicate briefly three causes, which might have contributed to this difference.

9. Indicate with reasons how you would consider the following while reconciling the financial profits with the profits as shown by the cost accounts :

(a) Over-valuation of closing stock in cost accounts.

(b) Under-absorption of factory overhead.

(c) Income-tax provided in financial accounts.

10. What do you mean by Integrated Accounts ? Discuss its advantages.

11. Distinguish between 'inter-locking' and 'integration' of cost and financial accounts.

12. Explain why the Cost and Financial Profit and Loss Accounts in integral accounts do not need to be reconciled. •

13. Can standard costs be introduced in integrated system of accounting ? Explain briefly how this can be done, if at all.

Practical :

Re : Cost Control Accounts

1. The balances in the cost ledger of a manufacturing company on 1st January, 1989, were as follows :

Stores Ledger Control Account	7,560
Work-in-Progress Control Account (at factory cost)	12,600
Finished Stock Control Account (at factory cost)	2,250
Cost Ledger Control Account	22,410

You are given the following information for the year, 1989 :

	Rs.
Purchases of materials	43,200
Direct factory wages	61 200
Manufacturing expenses	36,216
Materials issued to production	42,480
Selling expenses	5,760
Manufacturing expenses recovered	35,700
Selling expenses recovered	5,610
Sales	1,48,800
Stock of finished goods, 31st December, 1984, at factory cost	3 390
Work-in-Progress, 31st December, 1984, at factory cost	16,920

There was no loss or wastage of materials or of finished or partly finished goods.

You are required to (i) show the accounts in the cost ledger for the year 1989, (ii) prepare the costing profit & loss account for the year, and (iii) extract a trial balance as at 31st December, 1989.

2. From the following details show the necessary accounts in the Cost Ledger :

Opening Balances :	Rs.	Closing Balances :	Rs.
Materials	8,000	Materials	11,000
Work-in-Progress	5,000	Work-in-Progress	9,000
Finished Goods	10,000	Finished Goods	12,000

Transactions during the period :

Materials purchased	Rs. 25,000
Wages paid (including Rs. 2,000 indirect wages)	Rs. 70,000
Overhead incurred—Rs. 8,000 (recovered Rs. 9,000)	
Sales	Rs. 50,000

3. The following balances appeared in the Books of B. S. Chemicals Ltd, on 1st January, 1989 :

	Rs.	Rs.
General Ledger Adjustment Account		30,400
Stores Ledger Control Account	17,500	
Work-in-Progress Ledger Control Account	8,560	
Finished Goods Ledger Control Account	4,340	
	30,400	30,400

On 31st December, 1989 the following information was supplied :

	Rs.	Rs.
Purchase of stores		1,21,280
Purchase for special job		3,900
Direct wages	77,254	
Indirect factory wages	19,086	
Administrative salaries	13,462	
Selling and distribution salaries	8,504	1,18,306
Production expenses		20,864
Administration expenses		19,092
Selling and distribution expenses		12,860
Stores issued to production		1,13,002
Stores issued maintenance account		5,172
Returns to suppliers		624
Production overhead absorbed by production		46,820
Administrative overhead absorbed by finished goods		30,300
Selling overhead recovered on sales		19,030
Products finished during the year		2,37,034
Finished goods sold at cost		2,66,764
Sales		3,10,000

Record the entries in cost ledger for the year 1989 and prepare a Trial Balance.

4. From the following information prepare Work-in-´rogress Control Account, Materials Control Account and Production Overhead Control Account :

(i) Extracts from the financial profit and loss account for the year ended 31st October, 1989 :

Raw Materials :	Rs.	Rs.
Opening Stock	24,130	
Purchases	51,480	
	75,610	
Closing Stock	27,310	48,30）
Direct Wages		18,4;0
Production overhead		40,620

(ii) Information from cost accounts :

(a) Control accounts balances at 1st November, 1988 include :

	Rs.
Raw materials	24,620
Work-in-Progress	32,170

(b) Transactions for the year include :

Raw materials issued	48,730
Cost of products produced	1,15,460
Loss of raw materials in stores	510

(c) Production overhead has been absorbed at a rate of 250% of direct wages :

5. As at 31st March, 1990 the following balances existed in a company's cost ledger :

	Rs.	Rs.
Raw materials control account	1,20,574	
Work-in-Progress control account	48,946	
Finished stock control account	1,00,778	
Factory overhead control account		4,210
Cost ledger control account		2,66,088
	2,70,298	2,70,298

During the next three months the following items arose

		Rs.
Finished output (at cost)		84,334
Factory overhead incurred		36,604
Raw materials purchased		49,200
Salaries & wages payments :		
Direct Labour	20,212	
Factory Salaries	8,666	28,878
Cost of sales		74,356
Sales returns (at cost)		50,926
Materials returned to (and credited by) suppliers		1,160
Factory overhead allocated to production		30,880

You are required to write up the accounts and make a schedule of the closing balances, stating what each balance represents.

6. The following balances are extracted from a Cost Ledger as on 31st March, 1990 :

	Rs.	Rs.
Stores Ledger Control A/c	3,150	
Work-in-Progress A/c	2,352	
Finished Stock A/c	1,674	
Works Overhead A/c		30
Administration Overhead A/c	18	
Cost Ledger Control A/c		7,164
	7,194	7,194

Further transactions took place during the ensuing six months as follows :

	Rs.
Stores purchases	19,800
Stores issued to production orders	11,790
Stores issued to repair orders	450
Productive wages	17,700
Unproductive wages	750
Works overhead allocated to production orders	5,370
Carriage inwards	180
Works expenses	4,200
Administration expenses	540
Administration overheads allocated to production orders	552
Goods finished during the year	35,160
Finished goods sold	36,000
Sales expenses	402

Write up the entries in the Cost Ledger Accounts and prepare a Trial Balance.

7. The following are the balances which appeared in the Cost Ledger of PQ Manufacturing Co. Ltd. at January 1, 1989 :

	Rs.	Rs.
Stores Ledger Account	18,500	
Work-in-progress Account	3,500	
Finished Goods Account	22,500	
Cost Ledger Control Account		44,500
	44,500	44,500

The transactions during the year, 1989, were as follows

	Rs.
Purchases of Materials	1,30,000
Productive Wages	25,000
Unproductive Wages	3,000
Works expenses	57,500
Administration Expenses	11,000
Depreciation of Factory Machinery	5,000
Depreciation of Office Furniture	750
Materials Issued for Production	1,22,500
Materials Issued for Works Orders	5,000

	Rs.
Works overhead allocated to Production	72,500
Administration overhead allocated to Production	11,500
Goods finished during the year (at cost)	2,32,500
Cost of goods sold	2,47,500

You are required to :

(a) Write up the accounts in the Cost Ledger for the year.

(b) Prepare a Trial Balance as at 31st December, 1989.

(c) Explain briefly what each item in the Trial Balance represents.

8. The following balances are shown in the cost ledger of Peekay Ltd. as on 1st October, 1988 :

	Dr. (Rs.)	Cr (Rs.)
Work-in-Progress Account	7,056	
Factory Overhead Suspense Account	360	
Finished Stock Account	5,274	
Stores Ledger Control Account	9,450	
Administration Overhead Suspense Account	180	
General Ledger Adjustment Account		22,320

Transactions for the year ended 30th September, 1989

	Rs.
Stores issued to production	45,370
Stores purchased	52,400
Materials purchase for direct issue to production	1,135
Wages paid (including indirect labour Rs. 2,520)	57,600
Finished goods sold	1,18,800
Administration expenses	5,400
Selling expenses	6,000
Factory overheads	15,600
Stores issued for capital work-in-progress	1,500
Finished goods transferred to warehouse	1,08,000
Stores issued for factory repairs	2,000
Factory overheads applied to production	16,830
Administration overheads charged to production	4,580
Factory overheads applicable to unfinished work	3,080
Selling overheads allocated to sales	5,500
Stores lost due to fire in stores (not insured)	150
Administration expenses on unfinished work	850
Finished goods stock on 30-9-89	14,274

You are required to record the entries in the cost ledger for the year ended 30th September, 1989 and prepare a Trial Balance as on that date.

Re : Reconciliation of Cost and Financial Accounts

9. Find out the profits of Joy Industries Ltd. as per costing records and financial accounts from the following information and reconcile the results :

Number of units produced and sold	1,200
Total direct materials	Rs. 7,200
Total direct wages	Rs. 6,000
Selling price per unit	Rs. 25

Works expenses are charged at 80% of direct wages and office expenses at 25% of works cost. Actual works expenses amounted to Rs. 5,000 and office expenses to Rs. 4,000. There were no opening or closing stocks.

10. Find out the profits as per costing records and financial accounts from the following information and reconcile the results :

	Product A	Product B
Number of units produced and sold	600	400
	Rs.	Rs.
Total direct materials	7,200	5,600
Total direct wages	6,000	4,800
Selling price per unit	50	60

Works expenses are charged at 80% of direct wages and office expenses at 25% of works cost. Actual works expenses amounted to Rs. 9,000 and office expenses to Rs. 7,800. There were no opening and closing stocks.

11. A radio manufacturing company, which commenced business on 1st January, 1989, supplies you with the following information and asks you to prepare a statement showing the profit per radio set sold. Wages and materials are to be charged at actual cost, works overhead at 80% on wages and office overhead at 20% on works cost. You are also required to prepare a statement reconciling the profit as shown by the Profit and Loss Account for the year ended 31st December, 1989, with that shown in the cost accounts.

Two types of radio sets are manufactured, namely Model A and Model B. There were no radio sets in stock or in course of manufacture at the end of the year, and the number of radio sets sold during the year were Model A 1,200 and Model B 840.

The particulars given are as under :

	Model A	Model B
	Rs.	Rs.
Materials per radio set	80	100
Wages per radio set	40	60
Selling price per radio set	200	300

The works indirect expenses were Rs. 80,000 and the office indirect expenses were Rs. 70,000.

12. The Trading and Profit and Loss Account of a company for the year ended 31st December, 1989 was as follows :

	Rs.		Rs.
Purchases	30,240	Sales : 60,000 units	
Less : Closing stock	5,670	@ Rs. 1·50 each	90,000
	24,570	Discount received	300
Direct wages		Profit on sale of land	3,580
Works expenses			
Selling expenses			
Administration expenses			
Depreciation			
Net Profit			
			93,880

The profit as per cost accounts was only Rs. 30,100. Reconcile the financial profits and profits as per cost records using the following information ;

(a) Cost accounts value of closing stock Rs. 5,900.

(b) The works expenses in the cost accounts were taken at 100% of direct wages.

(c) Selling and administration expenses were charged in the cost accounts at 10% of sales and Re. 0·10 per unit sold respectively.

(d) Depreciation in the cost accounts was Rs. 1,500.

13. The Summarised Trading and Profit and Loss Account of a manufacturing company is as follows :

(Financial Books)

Trading and Profit and Loss Account for the year ended 31.3.1990

	Rs.		Rs.
To Opening Stock	2,400	By Sales (1,300 units	
„ Purchases	61,800	@ Rs. 100 each)	1,30,000
„ Productive Wages	19,000	„ Closing Stock	4,200
„ Factory Overhead	10,100	„ Bank Interest	950
„ Office and administrative			
Overhead	11,250		
„ Debenture Interest	600		
„ Preliminary Expenses			
(written off)	300		
„ Selling Overhead	1,400		
„ Net profit	28,300		
	1,35,150		1,35,150

Information received from Cost Books.

(*i*) Opening Stock Rs. 2,700 ; Closing Stock Rs. 4,000.

(*ii*) Office and Administrative Overhead charged Rs. 11,500.

(*iii*) Factory Overhead recovered at 50% of productive wages.

(*iv*) Selling Overhead recovered @ Re. 1/- per unit sold.

(*v*) Profit Rs. 28,200.

Prepare a Reconciliation Statement.   (C. U., B. Com. Pass)

14. The following information is obtained from the financial books of PR Ltd. for the year ended 31st March, 1983 :

Profit and Loss Account for the year ended 31-3-90

	Rs.		Rs.
Opening stock : 1,000 units		Sales : 20,500 units	14,35,000
@ Rs. 35 each	35,000	Closing stock : 500 units	
Materials consumed	5,20,000	@ Rs. 50 each	25,000
Wages	3,00,000		
Gross profit	6,05,000		
	14,60,000		14,60,000

	Rs.		Rs.
Factory overhead	1,89 500	Gross profit	6.05,000
Administration overhead	2,12,000	Interest	500
Selling expenses	1,10,000	Rent received	20,000
Bad debts	8,000		
Preliminary expenses	10,000		
Net profit	96,000		
	6,25,500		6.25.500

The cost sheet shows the cost of materials as Rs. 26 per unit and the labour cost as Rs. 15 per unit. The Factory overhead is absorbed at 60% of labour cost and administration overhead at 20% of factory cost. Selling expenses charged at Rs. 6 per unit. The opening stock of finished goods is valued at Rs. 45 per unit.

Prepare (i) a statement showing profit as per cost accounts for the year ended 31st March, 1900, and (ii) a statement showing the reconciliation of profit disclosed in cost accounts with the profits shown in the financial accounts.

15. The financial records of Pioneer Manufacturing Co. Ltd. reveal the following for the year ended 30th June 1989 :

		Rs. (in thousands)
Sales (20,000 units)		4,000
Materials		1,600
Wages		800
Factory Overheads		720
Office and Administration Overheads		416
Selling and Distribution Overheads		288
Finished Goods (1,230 units)		240
Work-in-Progress :		
Materials	48	
Labour	32	
Overheads (Factory)	32	112
Goodwill written off		320
Interest on Capital		32

In the Costing Records, factory overhead is charged at 100% of wages, administration overhead at 10% of factory cost and selling and distribution overhead at the rate of Rs. 16 per unit sold.

Prepare a statement reconciling the profit as per cost records with the profit as per financial records of the company.

16. The following is the extract of Trading and Profit and Loss Account of a manufacturing company for the year ended 31st December, 1989 :

	Rs.		Rs.
To Raw materials :		By Work-in-Progress :	
Opening stock	59,000	Materials	8,000
Purchases	3,73,000	Wages	11,000
„ Wages	5,96,000	Works expenses	6,600
„ Works expenses	3,81,500	„ Cost of goods Manufactured	13,19,900
		„ Closing stock of raw material	64,000
	14,09,500		14.09.500

	Rs.		Rs.
To Cost of goods sold	13,19,900	By Sales (15,200 units)	18,24,000
„ Administration expenses	2,45,000	„ Finished stock	
„ Selling and distribution		(2,800 units)	2,35,200
expenses	3,28,000	„ Interest on investment	13,600
„ Bad debt written off	35,000		
„ Net profit	1,44,900		
	20,72,800		20,72,800

The following information is also available :

(1) Wages include Rs. 20,000 outstanding.

(2) Works expenses are allocated to production at 60% of direct wages.

(3) Administration expenses are allocated at Rs. 12 per unit of production.

(4) Selling and distribution expenses are allocated so as to work out 20% of selling price.

Prepare Costing Profit and Loss Account and Statement of Reconciliation between cost financial accounts.

17. The net profit of a manufacturing company appeared at Rs. 1,28,755 as per financial records for the year ended 31st December, 1989. The costing records, however, showed a net profit of Rs. 1,72,400 for the same period. A careful scrutiny of the figures from both the sets of accounts revealed the following facts :

	Rs.
Works overhead under-recovered	3,120
Administration overhead recovered in excess	1,700
Depreciation charged in financial records	11,200
Depreciation recovered in costing records	12,500
Interest on investments not included in costing records	8,000
Obsolescence loss charged in financial records	5,700
Income-tax provided in financial books	40,300
Bank interest credited in financial books	750
Stores adjustments (credit in financial books)	475
Loss due to depreciation in stock value charged in financial books	6,750

Prepare a reconciliation statement.

18. The profit as per cost accounts is Rs. 1,50,000. The following details are ascertained on comparison of cost and financial accounts :

	Cost accounts Rs.	Financial accounts Rs.
(a) Opening stock :		
Materials	10,000	15,000
Finished goods	18,000	16,000
(b) Closing stock :		
Materials	12,000	13,000
Finished goods	20,000	17,000
(c) Interest charged, but not paid Rs. 10,000		

(d) Write off : Preliminary expenses Rs. 500 : Goodwill Rs. 1,500.

(e) Dividend received on shares Rs. 1,000.

(f) Indirect expenses charged in financial accounts Rs. 80,000, but Rs. 75,500 recovered in cost accounts.

Find out the profits as per financial accounts by drawing up a reconciliation statement.

19. 'I've got a problem', Avik Sen tells you at the Calcutta Club. My financial accountant tells me 'we've made a profit of Rs. 12,000 this month' but my cost accountant insists that the figure should be Rs. 16,000. Which one is right ?

You ascertain that Avik's Company keeps its financial and cost accounts separate, and you note the following information :

		Financial accounts	Cost accounts
(a)	Stock valuations :	Rs.	Rs.
	Raw materials : Opening	20,000	16,000
	Closing	24,000	22,000
	Finished goods : Opening	50,000	51,000
	Closing	60,000	61,500

(b) The following items do not appear in the cost accounts :

	Rs.
Donations	1,000
Profit on sale of motor car	2,000
Exchange rate losses	2,500
Bad debt written off	500
Discounts allowed	500
Discounts received	400
Rents receivable	500

You are required to prepare a statement reconciling the two profit figures.

20. The following summary of the Trading, Profit and Loss Account of Dixon Ltd. is provided with additional information :

	Rs.	Rs.
Sales		5,37,500
Opening Stock (800 units)	29,200	
Purchases	1,87,100	
Direct wages	1,09,700	
Works overhead	85,670	
Depreciation	28,210	
	4,39,880	
Closing stock (600 units)	26,400	4,13,480
		1,24,020
Gain on sale of investments		10,400
Investment income		2,700
		1,37,120
Administrative Expenses	27,540	
Finance Expenses	10,700	
Selling Expenses	35,180	
Distribution Expenses	29,640	
		1,03,060
Profit as per Financial Accounts		34,060

Notes :

(1) Sales were 4,300 units at Rs. 125 per unit.

(2) Stock is valued at prime cost in the cost accounts, but it includes overheads in the financial accounts. The overhead figures were Rs. 4,400 in the opening stock and Rs. 4,200 in the closing stock.

(3) Cost accounts charges were—works overhead—75% of Direct wages ; Depreciation Rs. 4,800+Rs. 6 per unit produced ; Administrative Expenses—fixed charge of Rs. 28,000 : Finance Expenses—fixed charge of Rs. 10,000 ; Selling Expenses—Rs. 8 per unit sold, Distribution Expenses 6% of turnover. There was no stock of work-in-progress.

You are required to reconcile the profit shown above with the profit in the cost accounts.

21. The financial accounts of a manufacturing company for the year ended 31st March, 1990 show an amount of Rs. 90,000 as profit after providing for income-tax. The following items have been included in the accounts :

	Rs.
Interest received	4,500
Interest paid	6,000
Fines	200
Discount on debentures	100
Loss on sale of machinery	2,040
Audit fees	3,000
Dividend received	3,600
Income-tax	60,000

The costing profit and loss Account showed a profit of Rs. 1,59,840 after including notional rent of Rs. 4,500.

Opening and closing stocks were valued as follows :

	Financial accounts		Cost accounts	
	Opening	Closing	Opening	Closing
	Rs.	Rs.	Rs.	Rs.
Raw materials	1,32 600	1,45,800	1,52,600	1,67,200
Work-in-Progress	60,200	78,600	62,300	79,800
Finished goods	75,800	71,200	78,500	87,500

Prepare a statement reconciling the profit in the financial accounts with the profit in the cost accounts.

22. According to the Cost Books, the profit for the year was Rs. 48,390, The Financial Books of the company disclosed the following position :

Dr. *Manufacturing Account* **Cr.**

		Rs.			Rs.
Raw Materials			Transfer to Finished		
Opening stock	1,9\0		stock A/c		1,11,400
Purchases, less Returns	54,900				
	56,800				
Less : Closing stock	1,800	55,000			
Direct Labour		35,500			
Factory Overhead		21,400			
		1,11,900			
Work-in-Progress					
Opening	8,400				
Closing	8,900	5C0			
Factory cost production		1,11,400			1,11,400

Dr. *Finished Stock Account* **Cr.**

	Rs.		Rs.
Opening Stock	11,600	Cost of sales transferred to	
Transfer from Manufacturing A/c	1,11,400	Trading A/c	1,10,700
		Closing stock	12,300
	1,23,000		1,23,000

Dr. *Trading Account* **Cr.**

	Rs.		Rs.
Factory Cost of sales transferred		Sales	1,84,500
from Stock A/c	1,10,700		
Gross Profit c/d	73,800		
	1,84,500		1,84,500

Dr. *Profit and Loss Account* **Cr.**

	Rs.		Rs.
Administration Expenes	15,600	Gross Profit b/d	73,800
Distribution Expenses	10,182	Discounts received	1,806
Discount allowed	1,511	Bank Interest received	37
Debenture Interest	850	Dividends received	300
Fines	500		
Losses of non-trading nature	350		
Net Profit	46,950		
	75,943		75,943

The valuations in the Cost Books were as follows :

	Opening balance	Closing balance
	Rs.	Rs.
Raw Materials	1,969	1,850
Work-in-Progress	8,280	8,730
Finished stock	11,396	12,810

Depreciation amounting to Rs. 6,146 was charged in the cost Books, whereas Factory overhead in the Financial Books included Rs. 5,873 under this head

The profit shown in the Cost Books has been arrived at after charging Notional Rent Rs. 1,500 and Interest on own Capital Rs. 3,000.

You are required to show the reconciliation of the Cost and Financial Books in an orderly manner.

23. The following represents the Trading and Profit and Loss Account of a manufacturing company which produces a standard product :

	Rs.			Rs.
Materials consumed	28,000	Sales		76,000
Productive wages	19,500	Stock of finished goods		2,000
Factory expenses	15,000	Work-in-Progress—		
Administration expenses	14,000	Materials	3,000	
Net profit	7,300	Wages	1,600	
		Factory expenses	1,200	5,800
	83,800			83,800

1,640 units were manufactured during the year, and 1,600 units were sold during the same period.

The cost records showed that factory expenses work out at Rs. 8 and administration expenses at Rs. 10 per unit produced.

From the foregoing information prepare (a) Factory Overheads A/c, (b) Administration Overheads A/c in costing books, and (c) an account showing reconciliation between the total net profit as per cost accounts and the net profit shown in the financial books.

Re : Integrated Account

24. Journalise the following transactions, assuming that Cost and Financial Accounts are integrated :

	Rs.
Wages paid (30% being indirect)	15,000
Raw materials purchased	26,000
Direct materials issued to production	20,000
Wages charged to production	12,800

Cost Audit in India

Cost audit has been defined by the Institute of Cost and Works Accountants, London, as *"the verification of cost accounts and a check on the adherence to the cost accounting plan."* The Institute of Cost and Works Accountants, India, has defined cost audit as *"an audit of efficiency of minute details of expenditure while the work is in progress and not a post-mortem examination"*—(I.C.W.A., India, Cost Audit in Industry, P. 16).

Cost audit vs. Financial audit

Although the functions of cost audit and financial audit and the basic principles underlying both the audits are the same, the two audits differ quite a lot with regard to their approach and objectives. The major points of distinction are as below :

1. While financial audit aims at the verification of the correctness of the books of accounts, cost audit aims at efficiency of minute details of expenditure.

2. Financial audit indicates post-mortem examination of the books of accounts, but cost audit indicates audit while the work is in progress. Financial audit is *"fait accompli"* ; cost audit is mainly a preventive measure, a guide for management policy and decision, in addition to being a *barometre* of performance (vide Cost Audit in Industry—I.C.W.A., India).

3. Statutory financial auditor is appointed by the shareholders under the provisions of the Companies Act, but after the Companies Amendment Act of 1974, statutory cost auditor is appointed by the Board of Directors of the company with the previous approval of the Central Government.

4. Statutory financial auditor must be a Chartered Accountant within the meaning of the Chartered Accountants Act, 1949, but statutory cost auditor must be a Cost Accountant within the meaning of the Cost and Works Accountants Act, 1959, or a Chartered Accountant having the prescribed qualifications, if there is a dirth of Cost Accountants in the opinion of the Central Government.

5. In case of statutory financial audit, report is to be submitted to the company, but in case of statutory cost audit, report is to be submitted to the Company Law Board (Central Government) with a copy to the company.

6. Report of statutory cost auditor need not be placed before the annual general meeting unless specially directed by the Central Government, but report of the statutory financial auditor has to be placed before the annual general meeting.

7. Financial audit is done every year, but it is not so in case of cost audit, so far as the statutory requirement is concerned.

Cost (Part I)—45

Objects of Cost Audit

The objects of Cost Audit are as below :

1. Ascertainment of Cost and Cost Control

This object is achieved by (i) detecting errors, frauds and misappropriations, (ii) ensuring that cost records are properly maintained in accordance with the accepted principles adopted or the provisions of Section 209(1)(d) of the Companies Act, (ii) ensuring that the routine laid down is followed strictly.

2. Provide data for judgement and decision on various matters

Adequacy and effectiveness of the existing procedures, desirability of investment in particular projects, adequacy of return on capital invested, level of efficiency of operation, relative levels of efficiency of different firms brought under Cost Audit, formulation of import/export policy by the Government, formulation of price policy in private and public sectors by the Government, desirability of providing protection to any industry etc. are some of the matters to be judged and decided upon.

The first objective of Cost Audit is often referred to as audit of efficiency and the second objective is often referred to as audit of propriety.

According to I.C.W.A., India, *"Efficiency audit ensures application of the basic economic principle that resources flow into the most remunerative channel"* and *"Propriety audit is the audit of executive action and plans bearing on finance and expenditure of the company......"*—(Cost Audit in Industry, p. 7). The propriety audit depends a lot upon the attitude of the management/appointing authority and the scope of audit.

[*Note* : Statutory Cost Audit in India is not a regular annual feature and is not applicable to industries other than those brought under the provisions of Sec. 209(1) d of the Companies Act by official notification.

The faculty of the Cost and Works Accountants of India expressed the following views and suggestions to make the provisions of Sec. 233-B more meaningful :

   (a) Cost Audit has to play a constructive role towards higher efficiency and optimum results. The services of the Cost Accountants have to be utilized more extensively. Hence Cost Accountants should be given the exclusive right of Cost Audit.

   (b) More and more industries should be brought under the purview of the Cost Accounting Records Rules and Cost Audit (Report) Rules.

   (c) Providing for Audit of Cost Accounts by the firms of Cost Accountants.

   (d) Cost Audit in Industries should be made a regular annual feature.

   (e) Extending the time limit for submission of Audit Report by Cost Auditors.

   (f) Deleting penal provisions affecting Cost Auditors.]

"If Cost Audit contemplated by the provisions of Sec. 233-B is really to be useful, it must not be merely a post-mortem essay engaged in fault-finding, but be constructive and proceed in the direction of giving positive suggestions and guidelines helpful to management both in the direction of effecting economy and in improving efficiency."—Guide to Companies Act, A. Ramaiya, P. 419.

Appointment of Cost Auditor

A cost auditor can be appointed by two authorities—(i) *Internal authorities* and (ii) *External authorities.*

Internal authorities mean management. Management may appoint a cost auditor for any purpose including evaluation of the existing system of cost accounting. A cost auditor is appointed by the management mainly for detecting points of inefficiency.

External authorities are : (a) trade associations, (b) tribunals etc., and (c) the Government.

When there is cut-throat competition in price-cutting by member industries of a *trade association*, the members may influence the association to appoint a cost auditor to suggest a *minimum price* to be honoured by all members. The association, on its own accord, may appoint a cost auditor to study the comparative profit earning capacity of its members or to contest the price policy of the Government regarding the product of the member industries.

Labour tribunals may appoint a cost auditor with a view to settling labour disputes for more wage, bonus, or other financial benefits. Similarly, *Income-Tax Tribunals* may appoint a cost auditor to assess correct profit for assessment of tax.

The *Government* may appoint a cost auditor—

(i) to ascertain actual cost of *cost-plus contracts* given to private contractors

(ii) to consider the desirability of giving financial assistance or protection to any industry of public importance.

(iii) to fix fair price of any commodity in the interest of the people.

(iv) under Section 233-B of the Companies Act.

"Statutory cost audit, i.e., compulsory audit of cost accounts by an external and independent accountant under the provisions of law, is unknown outside India, though internal verification of cost accounting records as a part of a good cost accounting system or specific cost studies conducted at the instance of management either by company's own selected staff or outside consulting accountants, to improve operational efficiency or profitability or to secure cost reduction, are almost routine matters in advanced countries like the USA, or the U.K."—(*Cost Audit and Management Audit, J.G. Tikhe, Part I, Para 101*).

The Statutory provision regarding Cost Audit in India was first introduced by Companies (Amendment) Act, 1956. Since Cost Audit becomes a possibility, only when the cost accounts exist, the Amending Act also provided that any class of companies engaged in manufacturing, processing or mining activities may be asked by the Central Government to maintain records showing utilisation of labour, materials or other items of expenditure, as may be prescribed.

Section 209(1)d of the Companies Act (as amended in 1965), provides that the Central Government may require a company pertaining to any class of companies, engaged in production, processing, manufacturing or mining activities, to keep in the books of accounts such particulars relating to utilization of material or labour or to other items of cost as may be prescribed. For this purpose *Cost Accounting Records Rules* have been framed.

Section 233-B of the Companies Act (as amended in 1974) provides that, where in the opinion of the Central Government it is necessary to do so in relation to any company required under clause (d) of sub-section (1) of Section 209 to include in its books of accounts the particulars referred to therein the Central Government may, by order, direct that, an audit of cost accounts of the company shall be conducted, in such manner as may be specified in the order, by an auditor who shall be a cost accountant within the meaning of the Cost and Works Accountants Act, 1959. This section also provides that, if sufficient number of cost accountants as described above is not available, the Central Government may, by notification in the Official Gazette, direct that, for such period as may be specified in the said notification, such chartered accountant within the meaning of the Chartered Accountants Act, 1949, as possesses the prescribed qualification, may also conduct the audit of the cost accounts.

The recommendations of the Committee of Enquiry on the administration of Dalmia Jain Companies was implemented by the Amending Act of 1965 "to strengthen the provisions relating to investigation into affairs of companies and to provide more effective audit in dealing with cases of dishonesty and fraud in the corporate sector." Section 233-B was introduced to enable the Central Government to issue necessary directives for conducting cost audit of companies engaged in some specified activities.

By virtue of the provisions of Section 233-B of the Companies Act, cost audit of certain establishments, to be notified from time to time, has been made compulsory. For this purpose *Cost Audit (Report) Rules, 196* have been framed. These rules (amended in 1969 and 1971) apply in case of every company where an audit of cost accounts has been ordered by the Central Government u/s 233-B of the Companies Act.

It must be pointed out in this connection that, Cost Audit ordered by the Central Government u/s 233-B of the Companies Act is *Statutory Audit* and is quite distinct from the audit of cost accounts by internal or external persons appointed by the management for any reason whatsoever.

Eligibility for appointment as Statutory Cost Auditor u/s 233-B

Section 233-B of the Companies Act, as amended in 1974, provides that the audit is to be conducted in such manner as may be specified in the order by an auditor who shall be a Cost Accountant within the meaning of Cost and Works Accountants Act, 1959.

This section, as amended in 1974, further provides that, if the Central Government is of the opinion that sufficient number of Cost Accountants is

not available for conducting the audit of cost accounts of companies, generally the Government may, by a notification in the Official Gazette, direct that, for a specified period, such Chartered Accountan's within the meaning of the Chartered Accountants Act, 1949, as possess the prescribed qualifications, may also conduct the audit of cost accounts. The prescribed qualifications for a Chartered Accountant of this category mean either a pass in the final examination of the Institute of Cost and Works Accountants of India or of the Institute of Cost and Management Accountants of the United Kingdom or Part I of the Management Accountancy examination held by the Institute of Chartered Accountants of India (*Government Notification No. G.S.I. 258 dated 21-4-72*).

A partnership firm of Cost Accountants cannot be appointed as Statutory Cost Auditors of a Company in the firm name, but a partnership firm of Chartered Accountants can be appointed as Statutory Financial Auditors u/s 226(1) in the firm name.

A person who is appointed u s 224 as an auditor of a company shall not be appointed or re-appointed for conducting the cost audit i.e., the financial auditor of a company cannot be appointed as the cost auditor of that company even if he possesses the requisite qualifications.

If a Cost Accountant becomes disqualified after his appointment, he shall cease to conduct the audit of cost accounts.

[*Note* : At the time when Sec. 233-B was introduced, cost audit was allowed to be conducted by Cost Accountants as well as Chartered Accountants and other persons possessing the prescribed qualifications. The position has changed after the amendment of 1974.]

Powers and Duties of Statutory Cost Auditors

A cost auditor appointed u/s 233-B of the Companies Act shall have the same powers and duties in relation to an audit conducted by him as an auditor of a company has under sub-section 1 of Section 227 and such cost auditor shall make his report to the Central Government (Company Law Board) in such form and within such time as may be prescribed and shall also, at the same time, forward a copy of the report to the company. The audit conducted by an auditor u/s 233-B shall be in addition to an audit (i.e., financial audit) conducted by an auditor appointed u/s 224. When a company is directed by the Central Government to have its cost accounts audited, it becomes the duty of the company to give all facilities and assistance to the person appointed for conducting the audit of the cost accounts. The Cost Auditor shall submit his report in the prescribed form to the Company Law Board with a copy of the same to the company.

Duty of a Company after getting Statutory Cost Auditor's report

1. The company, within 30 days from the date of receipt of the copy of report, must furnish the Central Government with full information and explanations on reservation or qualifications contained in such a report.

2. The Central Government, after considering the report and the information and explanations, may call for further information and explanations, if necessary, and the company must furnish the same within the time prescribed by the said Government.

Power of the Central Government over audit

1. The Central Government may call for *further* information and explanations on reservations and qualifications contained in the audit report, if it is felt necessary after considering the report and the information and explanations furnished by the company within 30 days from the date of receipt of the report.

2. On receipt of the report and explanations etc. it may take such action on the report, in accordance with the provisions of Companies Act or any other Law for the time being in force, as it may consider necessary.

3. It may direct the company undergoing cost audit u/s 233-B, to circulate to its members, along with the notice of the annual general meeting to be held for the first time after the submis ion of such report, the whole or such portion of the said (cost audit) report as it may specify in this behalf.

Penalty Provision for a Company

If a Company makes any default in complying with the provisions of Sec. 233-B, it will be liable to a fine upto R . 5,000.

Every officer of the company, who is in default, is also liable to imprisonment upto 3 years or a fine upto Rs. 5,000 or both.

Penalty Provision for a Statutory Cost Auditor

Under the Cost Audit (Report) Rules, the cost auditor is punishable with a fine extending to Rs. 500, if he fails to .

(a) Submit his report to the Company Law Board in the form and in accordance with the procedure laid down and to forward, at the same time, a copy of the report to the company (Rule 3).

Or,

(b) Submit his report to the Company Law Board and to the company within *120 days* from the end of the company's financial year to which the report relates.

Cost Accounting Records Rules and Cost Audit Report Rules

In the foregoing pages we have made reference to *Cost Accounting Records Rules* and *Cost Audit (Report) Rules.*

Under the provisions of Section 209 of the Companies Act, 1956 as amended, the Government of India has taken power to order companies engaged in production, processing, manufacturing or mining activities, to maintain in their books of accounts certain prescribed particulars relating to utilisation of material, labour and other items of cost. By virtue of the power given by this Section, the Government has, from time to time, selected specified industries to be brought under the purview of these provisions of

the Act and has framed Cost Accounting Records Rules for each such industry. These rules provide the guidelines for the companies regarding maintenance of cost accounting records. The details of the rules vary according to the nature of the industry.

The Cost Accounting Records Rules provide, in general, the details of records to be kept in respect of production materials : consumable stores, spares, small tools etc. ; power, fuel, steam etc. ; wages and salaries ; service department expenses ; depreciation : royalties and technical aid : overheads, work-in-progress : reconciliation of cost and financial accounts ; stock verification.

The Cost Accounting Records Rules also prescribe forms of the various cost statements in which the costs of the products are required to be exhibited.

Cost Accounting Records Rules have so far been framed for the industries named below. More and more industries are likely to come under cost audit in near future.

Cement, Cycle, Tyre and Tube, Caustic Soda, Room Air Conditioner, Refregerator, Automobile Battery, Electri Lamp, Motor Vehicle, Electric Fan, Electric Motor, Tractor, Aluminium, Vanaspati, Bulk Drugs, Sugar, Infant Milk Food, Paper, Ethyl Alcohol, Jute, Dyes, Rayon, Soda Ash, Cotton Textile, Polyester, Nylon.

Where a Cost Accountant is appointed under the provisions of Section 233-B of the Companies Act, the procedure for framing the report to be submitted by the cost auditor and the detail which the report should contain have been prescribed in the Cost Audit (Report) Rules, 1968 (as amended in 1969 and 1971).

The proforma of a Cost Audit Report is reproduced from Cost Audit (Report) Rules, 1968, as below :

COST AUDIT (REPORT) RULES, 1968

Cost Audit Report

I/we* ......having been appointed as auditor(s) under Section 233-B of the Companies Act, 1956 (1 of 1956) herein after referred to as the "Cost Aoditor(s)" of Messrs......Ltd. (herein after referred to as company), have examined the books of accounts prescribed under clause (d) of sub-section (1) of Section 209 of the said Act and other relevant records for the year ended......relating to**......maintained by the company and report that :

(a) I/we* have obtained all the information and explanations which to the best of my/our knowledge and belief were necessary for the purposes of this audit ;

(b) proper cost accounting records as required under clause (d) of sub-section (1) of Section 209 of the Companies Act, 1956 (1 of 1956) have been kept by the company ;

(c) proper returns adequate for the purpose of my/our* cost audit have been received from branches not visited by me/us* ;

(d) the said books and records give the information required by the Companies Act, 1956 (1 of 1956) in the manner so required ; and

(e) *in* my/our* opinion the company's cost accounting records have been properly kept so as to give a true and fair view of the cost of production, processing, manufacturing or mining activities, as the case may be, and marketing of the product under reference.

The matters contained in the Annexure to this report form part of this report, which is also subject to my/our* observations made therein.

Dated this......day of......19......at†......

Cost Auditor(s)

*Delete inapplicable words
**Here specify the product under reference
Here mention place

Types of Cost Audit

The following are the various types of audit on the basis of functions of the audit :

1. *Propriety Audit or Higher Audit*

It refers to the audit of the actions and plans of the management which have a bearing on the finances and expenditure of the organisation. Its scope depends upon the outlook of the management.

2. *Efficiency Audit*

The scope of efficiency audit is to determine whether a plan has been executed efficiently. It is also known as *performance audit*. Efficiency audit covers examination of the plan itself ; comparison of the performance with the plan or previous performance, or the performance of similar organisation ; investigation into variances etc. It aims at effecting real economy.

3. *Operational Audit*

It refers to the audit of each operation of the concern, e.g., production, sales, administration etc. It appraises of the control system operating in various operations of the business and aims at improving the system, if necessary.

4. *Voucher Audit*

It is also known as honesty and integrity audit. It covers routine check of all the transactions with the respective vouchers to ensure that the transactions are true and correct and supported by vouchers.

5. *Regulation Audit*

Regulation audit aims at looking into whether the organisation has correctly and faithfully followed the rules and procedures prescribed.

6. *Statutory Audit*

Any audit conducted in accordance with the provisions of any Act or Statute is called statutory audit. Audit conducted by auditors appointed

under the provisions of Section 233-B of the Companies Act is statutory cost audit. Audit of the Government departments and statutory bodies, conducted by the Comptroller and Auditor General of India, is also statutory audit.

Advantages of Cost Audit

Advantages of cost audit are derived by *the management, the shareholders the Government, the Consumers* and *the Cost Accountant. The following are the principal advantages* :

1. *From the points of view of the Management*

   (a) Errors, frauds misappropriations etc. are detected and thereby efficiency is improved.

   (b) The cost data obtained become more dependable.

   (c) Methods of cost accounting and control improve as a result of audit.

   (d) Management may become more cost conscious on the basis of cost audit report.

   (e) Wastes etc. can be minimised.

2. *From the points of view of the Shareholders.*

   (a) Cost audit ensures the correctness of the valuation of closing stock and work-in-progress. Error in this valuation renders the profit erroneous.

   (b) Cost audit by external auditors reveals standard of efficiency of management ; standard of utilisation of material, labour and other resources ; weak and strong points in the organisation, productivity of the factors etc.

3. *From the points of view of the Government*

   (a) It helps to settle the bills of cost-plus-contracts entered into by the Government.

   (b) It helps to judge the desirability of giving tariff protection to any industry.

   (c) It helps the Government to formulate price policy.

   (d) Where cost audit reveals inefficiency of the management, the Government may take over management temporarily.

   (e) Cost information revealed by cost audit may be used by the monopoly commission.

4. *From the points of view of the Consumers*

   (a) Correct cost is ascertained, if cost audit is introduced. Selling price is fixed on the basis of cost. So, unreasonable price cannot be charged to the consumers.

   (b) If cost is reduced due to more effective control exercised on the basis of the observations of the audit, the consumers may get greater advantage.

5. *From the points of view of the Cost Accountant*

   (a) When audit discloses that the accounts are accurate, status of the Cost Accountant is raised.

(b) Cost Accountant can learn many things from the external experienced Cost Auditor for improvement of his work.

(c) The staff of the Cost Accountant becomes more careful, if audit is introduced.

(d) Cost Accountant being an employee of the company enjoys the share of all advantages derived by the company from cost audit.

Cost Auditor's preparation for audit

While we discuss how a cost auditor should prepare himself for the audit of the cost accounts of a company, we refer to statutory audit. The cost auditor should take the following steps before he actually starts his audit work :

(i) Collection of general information regarding the industry.

(ii) Study the provisions of the Memorandum and Articles of Association of the Company

(iii) Collect the general information of similar companies through the journals and specially from the publications of the association of which the company is a member.

(iv) Get a copy of the cost accounting guidelines or manual issued by the company for use by staff, if any.

(v) Try to understand the methods of production and the process used.

(vi) Know the licenced capacity, installed capacity and utilised capacity.

(vii) Know whether the industry enjoys any extra privilege from the Government or local authorities.

(viii) Understand clearly the costing system followed with reference to the system followed by similar companies.

(ix) Know what different cost records and documents are prepared by the company with reference to those required u/s 209(1)d of the Companies Act, 1956.

(x) Get a list of the periodical cost statements which are being prepared and also other reports which are being presented to the management and the purposes thereof.

(xi) Ask the client to make all the records up-to-date.

(xii) Know about the basic raw materials and components used and their sources of supply.

(xiii) Study the terms of reference contained in the letter of appointment where partial audit is directed.

(xiv) Prepare an Audit Programme.

Cost Audit Programme

A cost audit programme is a list of work to be done systematically and methodically by the cost auditor in relation to the audit of cost accounts, compiled in such a manner that it covers all the work that he has to do in full discharge of his duties.

Outline of Cost Audit Programme

General Audit :

(a) See whether the routine established by the company has been followed.

(b) See that all records and documents as prescribed by law (or as desired in case of non-statutory audit) are maintained.

(c) See whether delegation of authority has been properly carried out to ensure that documents are signed by authorised persons only.

Material Audit :

1. Check the serial numbers of all the documents relating to materials, i.e., order for purchase, inspection note, goods received note, stores requisition, stores return note, stores transfer note etc

2. Check the goods received as per Goods Received Note (GRN) with the suppliers' challan and inspection note.

3. See wether goods returned have been properly acknowledged by the supplier.

4. Check the quantity of goods received as recorded in the Bin Card with the Goods Received Note.

5. Verify that supplier's bill shows the same rate as mentioned in the order for purchase.

6. Verify the authority for issue of materials.

7. Check the calculation of rates of issue on the basis of method followed.

8. See that correct rates have been put in Stores Requisition, Stores Return Notes, Stores Transfer Notes etc.

9. See that the value on the basis of the rate has been correctly worked out.

10. Check the Material Analysis, posting therefrom to various accounts concerned.

11. Check the entries in the Stores Ledgers, their balancing etc.

12. Make a test check of physical inventory and the valuation thereof.

13. Materials borrowed or lent from/to parties must be verified with the confirmation received from the party concerned.

14. Check the receipts, issue and balance of tools etc. and verify the stock in physical units and value.

15. Check the transfer to Variance Account where standard costing is in vogue.

Wages Audit

1. Check the following :
   (a) List of workers with the authority of appointments,
   (b) Recording of attendance, (c) Booking of time to jobs.
   (d) Reconciliation of time kept with time booked.

2. Check the calculation of wages (with reference to rates for each worker) including allowances, deductions etc.

3. See whether the way in which cash is handled for disbursement is satisfactory.

4. Check the classification of wages into direct and indirect.

5. Check the Wages Analysis Sheets and Wages Abstracts and also posting therefrom to various accounts.

6. Check the transfer to Variance Accounts where standard costing is in vogue.

Overhead Audit

1. Check the following :
   (a) classification of overhead functionwise or behaviourwise ;
   (b) the allocation of expenses to capital, revenue and deferred revenue ;
   (c) overhead booked to different standing order numbers and departments ;
   (d) the allocation and apportionment of expenses to production departments ;
   (e) the calculation of recovery rates and the charges made to jobs, processes etc. ;
   (f) the calculation of depreciation and the charges made for that in accounts ;
   (g) the idle time recording and treatment thereof.

2. Verify the amounts of over- or under-recovery and check the treatment thereof.

3. See that variances are transferred to Variance Accounts in case of standard costing.

4. Compare the actual Administration, Selling and Distribution overheads with the corresponding budgets and ascertain the differences.

5. Check the items not treated in Cost Accounts (but treated in Financial Accounts. Also check the notional items treated in Cost Accounts only. Verify the reconciliation done.

Miscellaneous Audit

1. Verify all elements of cost and their totals as shown in cost sheets and compare the total cost with the standards or estimates.

2. Compare actual sales with budgeted sales.

3. Compare Unit Cost with that of competing firms.

4. Check the 'excesses' and 'shortages' of stocks and the treatment thereof.

5. See posting made in the Assets Registers.

6. Check the accounts of tools, spares etc.

7. Examine the standards or budgets, particularly with reference to their being too high or too low and the necessity for revision.

Merits of Audit Programme

Audit programme has the following merits :
   (a) It ensures systematic and methodical audit work.
   (b) It ensures that no item of work is left out.

(*c*) It helps delegation of authority and responsibility to audit assistants who are required to sign on completion of work assigned to them.

(*d*) It helps the auditor to assess the progress of work and thereby helps him to complete the work by the time prescribed.

(*e*) Audit programme is a documentary evidence of what has been done by the auditor and what has been left out. Items not included in the programme represent items left out.

(*f*) It is subject to change and hence additions and alternations can be made, if considered necessary, while the audit is in progress.

EXERCISES

1. What is meant by 'Cost Audit' ? What are its objectives ?

<div align="right">(C. U., B. Com. Pass '85)</div>

2. How does Cost Audit differ from Financial Aduit ?

3. Who can appoint Cost Auditor ? Mention the purposes for which they may appoint Cost Auditors.

4. What do you mean by Statutory Cost Audit ? What are the provisions of the Companies Act regarding the appointment of Cost Auditors and enforcement of Cost Audit in any industry ?

5. Who are eligible for appointment as Cost Auditor u/s 233-B of the Companies Act ?

6. (a) State the circumstances under which the Central Government can appoint a Cost Auditor ?

   (b) What are the powers and duties of a Statutory Cost Auditor.

<div align="right">(C. U., B. Com. Pass—'87)</div>

7. Write what you know about :

   (a) Powers and duties of Statutory Cost Auditor appointed u/s 233 B of the Companies Act, 1956.

   (b) Duty of the company in relation to the Cost Audit Report (Copy) received from the Cost Auditor.

   (c) Power of the Central Government over the audit.

8. Mention the penal provisions for default by the company and by the Cost Auditor in relation to Statutory Cost Audit u/s 233-B.

9. Write short notes on :

   (a) Cost Accounting Record Rules.

   (b) Cost Audit (Report) Rules, 1968.

10. Present the proforma of Audit Report as provided in Cost Audit (Report) Rules, 1968.

11. What are the various types of Cost Audit ? Briefly discuss each type.

12. What advantages can be derived from Cost Audit from the points of view of the management, shareholders, government, consumers and cost account ?

13. You have been appointed Cost Auditor of a Company. What should be your preparation before actual commencement of the audit ?

14. What do you mean by a cost audit programme ? Make an outline of an audit programme for audit of materials.

15. What steps you should include in your audit programme for audit of wages ?

16. Mention your programme for audit of overhead.

17. Besides the programme for audit of materials, wages and overhead, what other work you should include in your audit programme ?

18. Mention the various merits of preparing audit programme before commencing audit.

APPENDIX I
SHORT-ANSWER TYPE QUESTIONS
INTRODUCTORY

1. What is cost accounting ?
2. What is costing ?
3. Differentiate between cost and costing.
4. Distinguish between costing and cost accounting.
5. Mention three important objectives of cost accounting.
6. What is a cost centre ?
7. Give three examples of service cost centres and three examples of production cost centres.
8. What do you mean by cost units ?
9. Indicate the unit of cost in the following industries :
    (a) Steel, (b) Brewery, (c) Brick kiln, (d) Transport, (e) Television.
10. Name the unit of cost in respect of the following industries :
    (a) Coal, (b) Bicycle, (c) Textile, and (d) Petroleum.
11. What is an opportunity cost ?
12. What is historical costing ?
13. Which method of costing is appropriate to the following types of commercial undertaking ?
    (a) a passenger bus company engaged in transport business ;
    (b) a radio manufacturer ;
    (c) a building contractor ;
    (d) a vanaspati manufacturer.
14. Under which system of costing would you place the following :
    (a) Chemical industry, (b) Collieries, (c) Electric light and power undertakings, (d) Ship building, and (e) Furniture manufacturing.
15. Give three examples of industries in which multiple costing is suitable for adoption.
16. What is operating costing ?

ELEMENTS OF COST

1. Name the different elements of cost.
2. What do you mean by 'cost classification' ?
3. What is the main purpose of cost classification ?
4. State three typical functions in a business by which costs may be classified.
5. Mention two methods of cost classification, other than by function.
6. What are chargeable expenses ? Give four examples.
7. What is Indirect Material ? Give an example. Distinguish between direct and indirect labour. Give four examples of indirect labour.
8. Give two examples each of direct materials and of indirect materials in any particular industry.
9. Distinguish between direct and indirect materials.
10. State how the same commodity may be a direct material in one case and an indirect material in another.
11. What is Indirect Labour ? Give two examples.
12. How are primary packing expenses treated in cost accounts ?
13. What is prime cost ? Name its components.
14. What is works cost ? Name its components.
15. Distinguish between cost of goods sold and cost of sales.
16. What do you mean by conversion cost ?
17. What do you mean by semi-variable expenditure ?
18. Fixed cost is always fixed.—Do you agree ? Give reasons.

19. **Which of the following may be treated as direct labour ?** : (a) supervisory labour responsible for production output, (b) maintenance and tool room operative, (c) operators assembling or changing the shape of raw materials, (b) salesmen.

20. Which of the following are likely to comprise direct materials ? : (a) cleaning materials and maintenance materials. (b) office furniture, stationery and canteen food, (c) timber, iron, steel and copper, (d) lubricant, jute and cotton waste, (e) electrical components and wiring.

21. Which of the following are examples of fixed cost in the short term ? : (a) rent, (b) royalty payments, (c) insurance, (d) consumable stores, (e) electricity watts consumed, (f) standing charges for gas.

22. Which one of the following is usually classified as a variable cost in the short term ? : (a) Cost of materials used, (b) Factory rate, (c) Factory rent, (d) Foreman's wages.

23. Which of the following comprise prime costs ? : (a) direct material, (b) indirect material, (c) chargeable expenses, (d) direct labour, (e) indirect labour, (f) works overheads, (g) administrative overheads, (h) selling and distribution overheads.

24. Which of the following are consumable materials ? : (a) component parts, (b) lubricants, (c) raw material, (d) cleaning materials, (e) fixing parts.

25. Which of the following is an alternative expression for indirect expenses ? : (a) prime cost, (b) production cost, (c) overhead, (d) work in-progress.

26. From the following particulars ascertain the value of raw materials consumed :

	Rs.
Raw Materials—Opening Stock	1,000
Closing Stock	2,000
Purchases	50,000
Carriage Inward	600

(*Ans.* : Rs. 49,600)

27 If the prime cost is Rs. 12,000, Overhead Rs. 18,000, Work-in-Progress at 1st January Rs. 3,000 and Work-in-Progress at 31st December Rs. 6,000, find out the cost of the year's production of finished goods. (*Ans.* Rs. 27,000)

28. Cost sheet of B. K. Industries for the month of January, 1990 :

	Rs.
Opening Stock of raw materials	9,000
Purchases of raw materials	60,000
Carriage on raw materials	5,000
	74,000
Less : Closing stock of raw materials	12,000
	62,000
Manufacturing wages	70,000
Chargeable expenses	3,000
	?
Rent and rates	15,000
Light and fan	8,000
Maintenance	2,000
Depreciation of machinery	12,000
Indirect wages	?
	1,75,000
Add : Work-in-Progress at 1st January	?
Less : Work-in-Progress at 31st January	7,000
Works cost	1,73,000

From the above cost sheet find out the following amounts :

(a) The cost of raw materials used, (b) the prime cost, (c) the total factory overheads, (d) the indirect wages for the year, (e) the work-in-progress at 1st January.

[Ans. :   (a) Rs. 62,000,   (b) Rs. 1,35,000,   (c) Rs. 40,000,   (d) Rs. 3,000,   (c) Rs. 5,000. *]*

29. In a factory annual output is 5,000 units, variable overhead expenditure Rs. 10,000 and fixed overhead expenditure Rs. 6,000. If the output is raised to 6,000 units, what will be the total overhead expenditure ?

     (Ans. : Rs. 18,000.)

30. The following represents the overhead costs of a manufacturing company relative to output :

	Cost (Rs.)	Output (Units)
January	2,186	5,620
February	2,690	7,300
March	3,023	8,410
April	2,390	6,300
May	2,060	5,200
June	2,759	7,530

Find out the (a) fixed overhead per month. (b) variable overhead per unit, (c) total overhead cost for July when output was 8,150 units.

[Ans. :   (a) Rs. 500,   (b) Re. 0·30,   (c) Rs. 2,945. *]*

MATERIALS

1. What is the main object of fixing minimum limit of raw materials ?
2. What do you understand by the following n connection with stock records :
   (a) Maximum Level. (b) Re-ordering or Ordering . evel.
3. What is ordering level ?
4. What do you mean by EOQ ?
5. What is the harm if the stock of any material exceed. the maximum limit ?
6. Should the store-keeper refuse to issue materials when the stock of that material has reached the minimum limit ?
7. What factors are to be considered for determining re-order quantity ?
8. State three important factors of determining maximum level of a raw material.
9. Mention two factors which determine minimum level of a raw material
10. What do you understand by inventory control ?
11. Mention two important duties of a store-keeper.
12. How do you distinguish between slow-moving and non-moving materials ?
13. Explain the term 'lead time'.
14. Under what circumstances should surplus materials be transferred to another job.
15. What is Stores Requisition ? Who issues it and to whom ?
16. What is Purchase Requisition ?
17. Give rulings for a Stores Requisition Note, using imaginary figures.
18. Distinguish between purchase requisition and stores requisition.
19. Distinguish between Purchase Order and Purchase requisition.
20. What is the function of a Goods Received Note ?
21. Mention any two documents that move between the Stores Department and the Production Department.
22. What is 'perpetual' inventory ? Does it differ from continuous stock taking ?
23. What do you mean by continuous stock taking ?
24. What are the important records of perpetual inventory system of stock control.
25. What is Bin Card ? What purposes does is serve ?
26. Give a specimen of a bin card.
27. How do stores losses arise ?
28. What are the reasons for discrepancy between Bin Card balance, Stores Ledger balance and physical balance ?

29. Give three reasons for the differences that may arise from *time to time between* the actual physical stock and the stock that should be in hand as per Bin Card.

30. Mention the important documents you will come across between the initiation of purchase and issue of materials to production departments.

31. What do you mean by ABC technique of stock analysis.

32. Mention four methods of pricing the issues of raw materials.

33. What is the 'last in first out' method of pricing issues of materials.

34. State the fundamental difference between FIFO and LIFO methods of pricing material issues.

35. State two advantages claimed for each of the FIFO and LIFO methods of pricing material issues.

36. Which method is said to be applied when stores are charged to production at the most recent price.
    [*Hints*] IFO]

37. Which method of stock valuation assumes that a fixed minimum stock is carried and always valued at the same cost ? [*Hints* : Base stock]

38. State the difference between the simple average method and weighted average method of pricing the issues of materials

39. Mention two advantages of charging out stores issues at standard price.

40. When market prices rise regularly state the effects on the profits of a company if issues of materials are valued, using (i) FIFO method and (ii) LIFO method.

41. At the time of rising prices which method of pricing materials issues should be followed ?

42. Which method is said to be applied when stores are issued to production at a price which will follow the price quoted on the last receipt.
    [*Hints* : NIFO]

43. From the following particulars ascertain the issue value of 100 units of materials on January 20 under (a) FIFO and (b) LIFO methods ·
    January 10 purchased 90 units @ Rs. 10 per unit
    January 15 purchased 80 units @ Rs. 12 per unit.
    [*Ans.* : FIFO Rs 1,020 ; LIFO Rs. 1,160]

44. From the data below, find out the cost of materials issued to production under (i) the first-in first-out method and (ii) the last-in first-out method.

Beginning balance	400 units at Rs. 3·00
Purchases	500 units at Rs. 3·25
Issued to production	600 units.

    [*Ans.* : (i) Rs. 1,850, (ii) Rs. 1,925]

45. At July 1, a stock balance was 800 units at a value of Rs. 2·20 per unit. For the next two months movements of stock were :

Receipts	*Qty.*	*Price*
July 2	12,000	Rs. 2·25
July 17	10,000	Rs. 2·20
Aug. 8	14,000	Rs. 2·30
Aug. 20	8,000	Rs. 2·40
Issues	*Qty.*	*Price*
July 8	10,000	Rs. 2·25
Aug. 12	12,000	Rs. 2·30
Aug. 18	4,000	Rs. 2·30 and Rs. 2·20
Aug. 25	16,000	Rs. 2·40 and Rs. 2·20

    What is the method of charging issues to production ? What is the value of stock at August 31 ?
    [*Ans.* : LIFO ; Rs. 6,260]

LABOUR

1. Name the methods of recording attendance time of workers in a factory.
2. What is a Time card ?
3. What is a Job card ?
4. What is piece rate method of payment of wages ?
5. What are the two basic methods of labour remuneration ?
6. How does the time rate method of remunerating labour differ from the piece rate method ?
7. Give two advantages and two disadvantages of piece-work.
8. Give two advantages and two disadvantages of time rate.
9. What is meant by 'incentive plan'in remunerating labour ?
10. What do you mean by 'premium bonus scheme' ?
11. State with examples the two most important methods of remunerating labour.
12. What is the 'Rowan system' of labour incentive payment ?
13. What is the fundamental difference between the Halsey scheme and Rowan scheme of premium bonus ?
14. When should a group incentive scheme be employed ?
15. Mention three causes of idle time.
16 Distinguish between 'normal idle time' and 'abnormal idle time'.
17. How should the abnormal idle time costs be treated in the books
18. Give four examples of normal idle time.
19. What is overtime ?
20. What is overtime premium ?
21. How is overtime premium calculated ?
22. How overtime wages should be treated in cost accounts ?
23. What do you mean by labour turnover ?
24. Give four causes of labour turnover.
25. Give a formula for measuring labour turnover.
26. An operator is allowed 8 hours 24 minutes to complete a job. The time taken is 7 hours 12 minutes. His rate of pay is Rs. 3·50 per hour. Calculate his bonus and total pay under the Halsey (50 per cent) scheme.
    [*Ans.* : Bonus Rs. 2·10 ; Total pay Rs. 27·30]
27. From the following details, calculate the total wages payable to a worker under the Halsey 50% scheme :
    Time allowed for the job :   4 hours 30 minutes
    Time taken for the job :   3 hours 15 minutes
    Rate of pay :   Rs. 2 per hour.   [*Ans.* : Rs. 7·75]
28. An operator is allowed 16 hours to complete a job. The time taken is 12 hours. His rate of pay is Rs. 4 per hour. Calculate his bonus and total pay under the Rowan scheme.
    [*Ans.* : Bonus Rs. 12 ; Total pay Rs. 60]
29. A worker is allowed 20 minutes to complete an operation *PQ*. In 8 hours attendance he completes a total of 30 *PQ*s. His rate of pay is Rs. 2·50 per hour. He is paid a bonus calculated as the proportion of time saved to time allowed multiplied by his attendance pay for the period. Calculate his bonus and total pay for the 8 hours work.
    [*Ans.* : Rs. 4 ; Rs. 24]

OVERHEAD

1. What is overhead ? Give examples.
2. What is variable overhead ? State with illustrations.
3. What do you mean by 'works overhead' ?

4. Name four items of expenditure which may be classified under the head 'factory overhead'.
5. What is 'administration overhead' ?
6. Indicate four important items of administration expenses.
7. What is 'selling overhead' ?
8. What is 'distribution overhead' ?
9. Name four items to be included under selling overhead.
10 Name four items of expenses to be included under distribution overhead.
11. Distinguish between 'selling overhead' and 'distribution overhead'.
12. Distinguish between 'cost allocation' and 'cost apportionment'.
13. What do you mean by 'primary distribution' and 'secondary distribution of overhead expenditure' ?
14. What is Service Department ? Give an example.
15 Name four Service Departments.
16. What bases of apportionments between departments would be considered appropriate for the following indirect expenses :
    (a) Rent. (b) Repairs to Machinery. (c) Staff Welfare Expenses, and (d) Electric Power ?
17. Allocated overhead expenses must be apportioned on some equitable basis. Relate each of the following expenses to a suitable basis from amongst the list.

Expense	*List of Bases*
(1) depreciation	machine capacity
(2) motive power	percentage of direct material cost
(3) stores expenses	floor area
(4) supervision	plant value
(5) rent	sales
(6) salesmen's commission	number of direct workers

18. What do you mean by 'Recovery of overhead' ?
19. Name the different methods of recovering factory overheads from production.
20. State the pros and cons of applying 'percentage on prime cost' method of allocating factory overheads.
21. What do you mean by Direct Labour Hour Rate ?
22. State the information required for arriving at a 'productive labour hour rate'.
23. What is Machine Hour Rate ?
24. For what purpose are Machine Hour Rates fixed ?
25. In what respect is 'labour hour rate' method of absorbing overhead different from 'percentage on direct wages' method ?
26. Works overhead is frequently allocated as a percentage of direct wages. Give two examples where this basis may give misleading results.
27. Which of the following should be used as a basis for absorbing works overheads :
    (a) a percentage of selling price ; (b) either machine hours or labour hours ;
    (c) the floor area of production departments requiring the overhead costs.
28. Distinguish between overhead expenses incurred and overhead expenses absorbed.
29. Give an example of over-absorbed factory overhead.
30. What is meant by over-absorption of overhead and under-absorption of overhead.
31. Give two methods of dealing with over- and under-absorption of overheads.

JOB AND CONTRACT COSTING

1. Mention the name of two industries where job costing can be applied.
2. State the difference between a 'job' and a 'contract'.
3. Which of the following conditions suggest a manufacturing concern to undertake job costing ?

(a) Production is continuous, (b) products are identical and cost is averaged, (c) each order is different.

4. For which of the following industries would a job order cost system be the best : a steel mill, a printing shop, a flour mill ?

5. Find out the price to be quoted for the following job whose costs are : materials Rs. 200 ; labour Rs. 250 ; overheads 100 per cent on labour cost ; profit 20% on selling price.
   [*Ans.* : Rs. 875]

6. Complete the following :
   (a) The job order cost system is most suitable where the product is..............
   (b) Under the job order cost system the costs are accumulated according to......
   (c) Under the job order cost system the unit cost is determined by dividing the............by the........................ .
   [*Ans.* : (a) made two individual customer's specification ; (b) job orders ; (c) total cost of the job, number of completed units]

7. State two methods of treatment of plants issued to contracts.

8. In contract costing how is notional pr fit determined ?

9. Give the formula for determining profit on incomplete contract.

10. Which of the following concerns undertake contract costing ?
    (a) engineering workshops, (b) building and civil engineering contractors (c) continuous processors, (d) consumer goods manufacturers.

11. What do you understand by 'retention money' and 'escalation' ?

12. How are progress payments dealt with : (a) in the books of contractors ; (b) on their Balance Sheet ?

13. How is work-in-progress calculated and dealt with in the contractors' Balance Sheet.

PROCESS COSTING

1. Mention three important features of process costing.

2. Name three industries where process costing can be applied.

3. Which of the following statements, summarising characteristic distinctions between process costing and job costing, are correct ?
   (a) Process requires less paperwork and administration than a job does.
   (b) Process is continuous production as distinct from the discrete nature of a job. (c) Individual units of output from a process can be costed. (d) The measurement of abnormal yield, or loss, is a feature of process costing. (e) Work-in-Progress is more accurate from process record.
   [*Ans.* : (a), (b) and (d)]

4. In process costing 'equivalent units' is applied to which of the following ?
   (a) by-products, (b) scrap losses, (c) work-in-progress, (d) finished stock.

5. Distinguish between 'scrap' and 'waste'.

6. Distinguish between defective work' and 'spoilage'.

7. Which of the following are regarded as 'normal' losses in a process ?
   (a) evaporation, (b) wastage, (c) spoilage, (d) rejects.

8. How scrap should be dealt with in cost accounts ?

9. How 'normal' and 'abnormal' process losses should be treated in cost accounts ?

10. Distinguish between joint products and by-products.

11. Give five examples of joint products and by-products.

12. How income arising from a by-product should be treated in cost accounts ?

13. Complete the following :
    (a) The process cost system is most suitable where the product is..................
    (b) Under the process cost system the costs are accumulated according to .....

(c) Under the process cost system goods are transferred from production departments to... ... .

(d) The number of equivalent units of production equals the number of ....for a processing department in which there is no work in process at the beginning or end of the period.

[*Ans.* : (a) produced in large volumes on a continuous basis ; (b) departments or processes for a given time period : (c) finished goods ; (d) completed units.]

14. Process I has an input of 100 units of crude material costing Rs. 2 per unit. and after refining it is expected that an 80 per cent yield will be achieved. Waste material is sold for Re. 0·80 per unit. The actual yield was 85 units after wages and overheads costing Rs. 136 had been applied Find out the cost per unit of refined material.

[*Ans.* : Rs. 4 per unit]

15. 3,000 units costing Rs. 4 per unit are put into process B and 2,400 units are transferred to finished stock at the end of the week. Other process costs were Rs. 8,280. The work-in-process is complete as regards materials, but only 60 per cent complete as regards other process costs. Find out the cost per unit of finished stock. Also find out the value of work in-progress.

[*Ans.* : Cost per unit of finished goods Rs. 7 : Value of work-in-progress Rs. 2,038.]

ACCOUNTING RECORDS

1. What are the accounts accommodated in cost ledger ?
2. Name four accounts which are opened in the Cost Ledger.
3. What do you mean by 'Integrated Accounts' ?
4. Given two benefits arising from integrated accounts.
5. Mention two causes of discrepancy between cost profit and financial profit.
6. Give three examples of items which would not normally appear in the cost accounts, though they would quite properly be included in financial revenue accounts.
7. Give journal entries for the following transactions assuming cost and financial accounts are integrated :
   (a) Purchased materials Rs. 500.
   (b) Issued materials to Production Department Rs. 200.

COST AUDIT IN INDIA

1. Mention two advantages of cost audit.
2. Can the shareholders of a company appoint a firm of cost accountants as Cost Auditor of the company ?

MISCELLANEOUS

1 Match the following .
   (a) Escalation clause   (1) Pay roll
   (b) FIFO   (2) Job evaluation
   (c) Wages Analysis Book   (3) Contract
   (d) Grading   (4) Pricing
2. Which items of the following would you include in costs ?
   (a) Import duties, (b) Interest on debentures, (c) Commission on sales, (d) Cash discount on purchases.
3. How would you deal with bad debt in cost accounts ?
4. How would you deal with Drawing and Design office costs in cost accounts ?

APPENDIX II
ANSWERS TO PRACTICAL EXERCISES
CHAPTER 2
Elements of Cost and Cost Sheet

1. (i) Rs. 12,630, (ii) Rs. 7,760, (iii) Rs. 14,190, (iv) Rs. 5,160.

Notes : (1) Travelling expenses and bad debts have been considered as part of Selling Expenses. (2) Discount allowed, donations and debenture discount will be excluded from costs.

2. (a) Rs. 1,65,000, (b) Rs. 1,91,700, (c) Rs. 1,97,900, (d) Rs. 2,11,000, (e) Rs. 39,000.

Note : Income-Tax is not an item of cost.

3. (i) Rs. 2,51,000 (considering packing expenses as an item of prime cost), (ii) Rs. 2,61,000, (iii) Rs. 153·53.

Note : The treatment of packing expenses depends upon the nature of the product. If the salable article is not complete without a package or container, e.g., cigarettes, matches and canned goods, the cost of packing forms part of the prime cost. If, however, packages are required only for the purpose of distribution, e.g., cartons to contain packages of cigarettes, cases for the despatch of canned goods, etc., they will form an expense of distribution.

4. Materials consumed Rs. 26,300, Prime cost Rs. 32,600, Works cost Rs. 36,400, Cost of production Rs. 41,800, Cost of goods sold Rs. 39,575, Cost of sales Rs. 41,075.

Notes : (i) Abnormal loss of materials should be excluded from costs.

(ii) Value of closing stock of finished goods $= $ Rs. $41,800 \times \dfrac{500}{4,000} = $ Rs. 5,225.

5. Materials consumed Rs. 2,27,140, Prime cost Rs. 3,54,340, Works cost Rs. 4,41,340, Cost of production Rs. 4,75,840. Cost of goods sold Rs. 4,75,000, Cost of sales Rs. 5,15,000, Profit Rs. 77,250.

6. Materials consumed Rs. 29,000, Prime cost Rs. 46,000, Works cost Rs. 58,800, Cost of production Rs. 61,800. Cost of goods sold Rs. 62,800, Cost of sales Rs. 66,800, Profit Rs. 10,200.

Note : Depreciation of plant and machinery will be added to works overhead and sale of scrap will be deducted therefrom.

7. Materials consumed Rs. 21,100, Prime cost Rs. 37,100, Works cost Rs. 41,600, Cost of Production Rs. 44,300, Cost of goods sold Rs. 47,200. Cost of Sales Rs. 50,000, Profit Rs. 10,000.

8. Materials consumed Rs. 1,08,000, Prime cost Rs. 1,75,200, Works overhead Rs. 20,000. Works cost Rs. 2,03,200, Cost of production Rs. 2,24,000, Closing stock of finished goods Rs. 14,000, Cost of goods sold Rs. 2,26,400, Cost of sales Rs. 2,46,650 (per unit Rs. 6·09), Profit Rs. 36,850 (per unit Re. 0·91).

Note : Unit cost of sales does not represent current unit cost because goods sold during the period include opening finished goods.

9. (i) Rs. 2,67,500, (ii) Rs. 3,32,500, (iii) Rs. 3,92,500, (iv) Rs. 3,92,667, (iv) Re. 0·2619.
   Value of closing stock Rs. 1,30,833. Total profit Rs. 7,333.

10. (a) (i) Rs. 1,36,400, (ii) Rs. 3,14,900, (iii) Rs. 4,50,800, (iv) Rs. 5,63,500, (v) Rs. 2,97,125 ; (b) (i) 80%, (ii) 25%, (iii) 34·5%.

11. Prime cost Rs. 6,85,000, Works cost Rs. 7,74,000, Cost of Production Rs. 8,04,000, Cost of goods sold Rs. 8,09,000.

Note : Selling and distribution overheads will be taken into consideration while ascertaining 'Cost of Sales'.

12. Prime Cost Rs. 4,50,000. Works Cost Rs. 5,76,000, Cost of Production Rs. 6,66,000, Cost of goods sold Rs. 6,01,875, Profit Rs. 2,08,125.

Notes : (1) Production during the year (30,000 + 10,000 − 8,000) or 32,000 units.

(2) Value of closing stock of finished goods Rs. 2,08,125 (on FIFO basis) (The result will be different if average cost or LIFO basis is applied).

13. (a) Rs. 29,800. (b) Rs. 64,000. (c) Rs. 63,750. (d) Rs. 11,250. (e) Re. 0·75.

14. Prime cost Rs. 1,09,000. Cost of Production Rs. 1,21,500. Cost of Sales Rs. 1,01,250. Percentage of profit on sales 10%. Price to be quoted for 750 fans Rs. 33,750.

15. Prime cost Rs. 24,000. Works cost Rs. 28,500. Cost of Production Rs. 34,200, Cost of goods sold Rs. 32 000. Cost of sales Rs. 40,000. Profit Rs. 24,000.

Note : Machine hours worked × Machine hour rate = Factory overhead.

16. Prime cost Rs. 1,10,000. Works cost Rs. 1,38,000. Cost of Production Rs. 1,72,500. Cost of goods sold Rs. 1,55,250. Cost of sales Rs. 1,86,300. Profit Rs. 46,575.

17. Prime cost Rs. 1,21,000. Works cost Rs. 1,41,000. Cost of Production Rs. 1,55,100. Cost of goods sold Rs. 1,40,080. Cost of sales Rs. 1,58,080. Selling price Rs. 1,97,600.

Note . Closing stock of finished goods has been valued on FIFO basis.

18. Cost of the job Rs. 5,040. Selling price Rs. 6,300.

Note : Factory Expenses 60% of Direct Wages ; Office and Administration Expenses 25% of Works Cost.

19. (a) Rs. 7,57,120. (b) Rs. 15,16,320. (c) Rs. 18,20,000. (d) Rs. 21,84,000. (e) 40%. (f) 20%. Amount of tender Rs. 1,43,520.

20. Prime cost Rs. 58 00 and Rs. 37·50, Works cost Rs. 76·00 and Rs. 49·50, Cost of production Rs 91·20 and Rs. 59·40. Cost of sales Rs. 116·20 and Rs. 74·40 per De Luxe set and Popular set respectively.

Note · Labour cost has been allocated in the ratio of 1,000 × 1·5 : 2,400 × 1 or 1,500 : 2,400

21. Material consumed Rs. 70,800 and Purchase of Materials Rs. 72,000 ; Factory overhead Rs 20 000 (i e., $\frac{100}{160}$ × 32,000) , Profit Rs. 31,200.

Note : Materials consumed is a balancing figure arrived at by working in the reverse order start ing from cost of goods sold. Similarly, materials purchased has come on as a balancing figure after determining materials consumed.

22. Cost per unit in '84 Rs. 11 00 ; Selling price Rs. 13·20.

23. Selling price per machine in 1985 Rs. 425.

Note : Manufacturing expenses will be 25 of prime cost.

24. Selling price Rs. 11,791.

Notes : (1) Relations in 1983 : (i) Factory overhead to Direct wages 72%. (ii) Administration overhead to Works cost 25·89%, Selling overhead to Works cost 17 26 , Distribution overhead to Works cost 8·63%. (2) Rate of profit in 1982 = 20% of cost.

CHAPTER 3
Materials

1. (a) A—320, B —480 ; (b) A—140, B—180 ; (c) A—390, B −450 ; (d) A—740, B—720.

2. (a) A—450, B −300 ; (b) A 200, B—150 ; (c) A—650, B—750 ; (d) A—425, B—450.

3. (a) A—900, B—1,000, C—810 ; (b) A—400, B—475, C—360 ; (c) A—1,450, B—1,600, C—1,350 ; (d) A—925, B—1,037, C—855.

4. 5 orders in a year ; EOQ 120 units.

Note : Applying formula, EOQ is 122 units.

5. 200 units.

6. (i) 800 units ; (ii) 4 orders in a year, (iii) 3 months.

7. EOQ 1,000 units ; 18 orders in a year. Total cost without discount Rs. 4,91,400 and with discount Rs. 4,81,705·20. Hence the offer is acceptable.

8. (i) 400 units, (ii) 10 orders, (iii) 340 units (assuming a safety stock of 100 units is desired).

9. (i) 4,000 units, (ii) 75 orders, (iii) 12,500 units.

10. EOQ 320 units ; 16 orders in a year ; ordering level 560 units.

11. Value of issues : Rs. 800 ; Rs. 1,950 ; Rs. 600 ; Rs. 1,200 ; Rs. 1,950. Value of closing stock Rs. 2,100

12. Value of issues : Rs. 300 ; Rs. 220 ; Rs. 240 ; Rs. 498. Value of closing stock Rs. 172.

13. Value of issues : Rs. 1,535 ; Rs. 675 ; Rs. 1,335. Value of closing stock Rs. 360.

14. Value of issues : Rs. 1,110 ; Rs. 990 ; Rs. 920 ; Rs. 1,800 ; Rs. 710 ; Rs. 1,290. Value of closing stock Rs. 1,540.

15. Value of closing stock : Under LIFO Rs. 24,200 ; Under FIFO Rs 32,050.

16. Value of issues : Under LIFO Rs. 4,200 ; Rs 6,000 ; Rs. 4,800 ; Rs. 12,600 ; Rs. 17,600 ; Rs. 8,500. Under FIFO Rs. 4,200 ; Rs. 6,000 ; Rs. 4,800 ; Rs. 10,740 ; Rs. 18,400 ; Rs. 8,060 ; Value of closing balance : Under LIFO Rs. 32,420 ; Under FIFO Rs. 33,920.

17. Value of issues : Rs. 50,000 , Rs. 36,000 ; Rs. 57,200 ; Rs. 36,000. Value of closing stock Rs. 66,500.

18. Value of issues : Rs. 14,400 ; Rs. 12,450 , Rs. 360 (shortage) ; Rs. 6,125 ; Rs. 7,800 ; Rs. 2,525 ; Rs. 8,100. Value of closing stock Rs. 21,590.

Note : Return from workshop has not been treated as a new receipt.

19. Value of issues : (a) Rs. 550 ; Rs. 500. (b) Rs. 560 ; Rs. 484 Value of closing stock : (a) Rs. 720 ; (b) Rs. 726.

20. Value of issues : (a) Rs. 600 ; Rs. 630 ; Rs. 1,150. (b) Rs. 22 per kg. (c) Rs 600 ; Rs. 640 ; Rs. 1,143, (d) Rs. 21·846153 per kg. Value of closing stock : (a) Rs. 460 ; (b) Rs. 420 ; (c) Rs. 457 ; (d) Rs. 457 ;

21. (a) Value of issues : Rs. 1,000 ; Rs. 2,200 ; Rs. 2,800. Value of closing stock Rs. 1,200.

(b) Value of issues : Rs. 1,000 ; Rs. 2,300 ; Rs. 2,600. Value of closing stock Rs. 1,300.

22. Weighted average—value of issues : Rs. 45,870 ; Rs. 77,771 ; Rs. 5,721 ; Rs. 96,831. Value of closing stock Rs. 49,013.
First in first out—value of issues : Rs. 45,870 ; Rs. 77,522 ; Rs. 5,928 ; Rs. 96,880. Value of closing balance Rs. 49,041.

23. Value of issues : Rs. 1,080 ; Rs. 2,124. Value of closing stock Rs. 236.

24. (a) Value of issues : Rs. 1,376 ; Rs. 2,640 ; Rs. 1,800 ; Rs. 3,294.
(b) (i) Rs. 9,110 ; (ii) Rs. 1,098 ; (iii) Rs. 183.

25. Value of issues : Rs. 6 ; Rs. 70 : Rs. 32·70. Value of closing stock Rs. 527·80.

26. Value of issues : Rs. 75,650 ; Rs. 1,21,040 ; Rs. 1,81,560 ; Rs. 1,83,552 ; Rs. 2,39,220 ; Rs. 1,75,428. Value of closing balance Rs. 15,950.

27.

	FIFO Rs.	LIFO Rs.	Weighted Average Rs.
For Job 268	60	120	90
For Job 269	80	100	90
Closing stock	160	80	120
	300	300	300

28. Value of issues : W. Av. Rs. 750, Rs. 927, Rs. 938, Rs. 1,397 ; FIFO Rs. 750, Rs. 925, Rs. 937·50, Rs. 1,400. Value of closing stock : Under weighted average Rs. 1,380·50 ; Under FIFO Rs. 1,380.

29. LIFO : Value of issues : Rs. 13,500 ; Rs. 14,000 ; Rs. 500. Value of stock : Rs. 10,000 ; Rs. 16,000 ; Rs. 2,500 ; Rs 15,500 ; Rs. 1,500 ; Rs. 1,000.
   FIFO : Value of issues : Rs. 13,000 ; Rs. 14,050 ; Rs. 650 ; Value of stock Rs. 10,000 ; Rs. 16,000 ; Rs. 3,000 ; Rs. 16,000 ; Rs. 1,950 ; Rs. 1,300.
   Simple Average: Value of issues Rs. 13,750 ; Rs. 13,750 ; Rs. 650. Value of stock : Rs. 10,000 ; Rs. 16,000 ; Rs. 2,250 ; Rs. 15,250 ; Rs. 1,500 ; Rs. 850.

30. (a) Rs. 1,000 ; (b) Rs. 900 ; (c) Rs. 950.

31. Fifo Rs. 34,000 ; Lifo Rs. 30,700.

32. Value of issues : (a) Rs. 2,250, Rs. 4,000, Rs. 550 ; (b) Rs. 2,200, Rs. 4,000, Rs. 500 ; (c) Rs. 2,500, Rs. 4,000, Rs. 600.
   Value of closing stock (500 units) : (a) Rs. 2,700 ; (b) Rs. 2,800 ; (c) Rs. 2,400.

33. (a) Value of issues : Rs. 1,80,000 ; Rs. 1,59,000. Value of closing stock : Rs. 33,000. (b) Value of closing stock : Rs. 30,900.

34. Pump A : Profit Rs. 11,600 ; Closing stock Rs. 56,000 ;
   Pump B : Profit Rs. 10,000 ; Closing stock Rs. 54,400.

35. FIFO : (a) Rs. 3,88,500 ; (b) Rs. 7,84,500 ; (c) Rs. 1,35,500.
   Weighted average (a) Rs. 3,90,000 ; (b) Rs. 7,83,000 ; (c) Rs. 1,37,000.
   LIFO (a) Rs. 3,93,000 ; (b) Rs. 7,80,000 ; (c) Rs. 1,40,000.

36. (A) FIFO method should be applied. Value of issues : Rs. 1,810 ; Rs. 1,240 ; Rs. 3,130 , Rs. 2,770 ; Rs. 2,095 ; Rs. 2,805. Value of closing stock Rs. 1,650.
   (B) LIFO method should be applied. Value of issues : Rs. 1,860 , Rs. 1,240 ; Rs. 3,160 ; Rs. 2,888 ; Rs. 2,142 ; Rs. 2,710. Value of closing stock Rs. 1,500.

37. Weighted average method has been adopted. Value of closing stock on this basis Rs. 13,344. Value of closing stock if FIFO basis is adopted Rs. 12,912·50.

38. (a) Charged to cost of production : (i) Rs. 11,400 ; (ii) Rs. 12,400. (iii) Rs. 11,800 ; (iv) Rs. 10,800 ; (v) Rs. 14,100.
   (b) Value of closing stock : (i) Rs. 3,200, (ii) Rs. 2,200 ; (iii) Rs. 2,800 ; (iv) Rs. 2,400 ; (v) Rs. 3,400.
   (c) Standard cost—Difference Rs. 1,400 (adverse material price variance) to be transferred to P/L A/c. Replacement cost—Difference Rs. 2,900 (favourable) to be transferred to Stock Revaluation Reserve A/c.

CHAPTER 4
Labour

1. (a) X—Rs. 3·75 , Y— R   5·00. (b) X - Rs. 3·00 ; Y —Rs. 6·00.
2. A—Rs. 215 ; B—Rs. 180   C— Rs. 222 ; D- Rs. 170.

3.

(i) *Day Wages*	Sonal Rs	Madhu Rs.	Batuk Rs.
Earnings	6·00	6·00	6·00
Labour cost per 100 pieces	3·33	5·00	6·00
Av. labour cost of the Co. per 100 pieces Rs. 4·50			
(ii) *Piece Rate*			
Earnings	13·50	9·00	7·50
Labour cost per 100 pieces	7·50	7·50	7·50
Av. labour cost of the Co. per 100 pieces Rs. 7·50			
(iii) *Halsey scheme*			
Earnings	9·75	7·50	6·75
Labour cost per 100 pieces	5·42	6·25	6·75
Av. labour cost of the Co. per 100 pieces Rs. 6·00			
(iv) *Rowan scheme*			
Earnings	9·33	8·00	7·20
Labour cost per 100 pieces	5·18	6·67	7·20
Av. labour cost of the Co. per 100 pieces Rs. 6·13			

4. Rate per hour Rs. 6·50. Wages payable Rs. 325.

5. Rs. 320 (time wage Rs. 240+bonus Rs. 80)

Note : Calculation of bonus—

Time saved=(200−120) or 80 hours

Expressed as a percentage of standard time$=\dfrac{80}{200} \times 100 = 40\%$

		Bonus hours
For the first 20 hrs. saved (i.e. 10% of standard time)	40% of 20= 8
,, ,, next 40 ,, ,, (,, 20% ,, ,, ,,)	50% of 40=20
,, ,, last 20 ,, ,, (,, 10% ,, ,, ,,)	60% of 20=12

80 hrs.   40%   40 hrs.

Bonus for 40 hrs. @ Rs. 2=Rs. 80

6. Rs. 70·80

7. Total earnings—Anand Rs. 105, Bhasheer Rs. 114·60, Chauhan Rs. 124·20, Devraj Rs. 143·40.

8. X—Rs. 3·90, Y—Re. 0·90, Z—Rs. 4·40.

9. Rs. 8.

10. Rs. 3·50.

11. Rs. 5·40.

12. (a) Rs. 3·17, (b) Rs. 2·975.

13.

	Halsey scheme Rs.	*Rowan scheme* Rs.
Remuneration —Abdul	140	128
—Basit	90	96
Effective hourly rate—Abdul	3·50	3·20
—Basit	2·25	2·40

14. (i) A—Rs. 10 ; B—Rs. 7 ; C—Rs. 8

(ii) A—Rs. 10 ; B—Rs. 7·50 ; C—Rs 8·40.

Note : Time taken by A is more than the time allowed. Hence he is not entitled to any bonus. He will get wages at the basic rate for the total hours worked.

15. (i) Rs. 52·80, (ii) Rs. 57·60.

16. (i) Rs. 240, (ii) Rs. 252.

Note : While calculating bonus, dearness allowance is not taken into consideration.

17. Rs. 24·50.

18. (a) Rs. 300 ; (b) Rs. 288 ; (c) Rs. 270.

19. (a) Rs. 225 ; (b) Rs. 270 ; (c) Rs. 202·50 ; (d) Rs. 216.

Note : Piece rate$=\dfrac{48 \times Rs. 3·75}{120}=$Rs. 1·50

20. (a) (i) Rs. 22·75 ; (ii) Re. 0, 0·529, (b) Rs. 21·40.

21. Total earnings for the week Rs. 1·76.

Note : Bonus Rs. (12+11·23)=Rs. 23·23 and house rent allowance Rs. 17.

22. Straight piece work 50 p ; Halsey plan 41·6 p ; Rowan plan 44·4 p.

23. Hourly rate 65 paise ; Total earnings under Rowan plan Rs. 4·35 and hourly rate 72·5 paise.

24. Halsey scheme : Rs. 9 ; Rs. 10·67 ; Rs. 14

Rowan scheme : Rs. 9·60 ; Rs. 11·20 ; Rs. 12·80.

25. (i) Rs. 15·75 ; (ii) Rs. 18·05 ; (iii) Rs. 19·00.

26. *Factory A :* Bonus Rs. 62·50 ; Total wages Rs. 562·50 ; Prime cost Rs. 1,562·50 ; Works cost Rs. 2,406·25.

Factory B : Bonus Rs. 78·75 ; Total wages Rs. 708·75 ; Prime cost Rs. 1,608·75 ; Works cost Rs. 2,553·75.

27. (a) Halsey method—total wages Rs. 230, hourly rate Rs. 1·438, factory cost Rs. 2,490. (b) Rowan method—total wages Rs. 234·37, hourly rate Rs. 1·467, factory cost Rs. 2,504.

28. Hourly rate : A – Rs. 1·50 ; B—Re. 1·00.   Factory cost A—Rs. 16·40 ; B—Rs. 13·40.

29. (a) 80% ; 100% ; 125 % ; 150%   (b) Rs. 32 ; Rs. 32 ; Rs. 38 ; Rs. 44.

30. Rs. 29·77.

31. (a) (i) Rs. 11·20, Re. 0·933 ; (ii) Rs. 12, Re. 0 857.
    (b) (i) Rs. 33·60 ; (ii) Rs. 36·80.

32. Halsey—total earnings Rs. 38·25 ; employer's savings Rs. 20·25. Rowan—total earnings Rs. 40·95 ; employer's savings Rs. 17·55.

33. (i) Saxena Rs. 50 ; Sarma Rs. 39·90 ; Saggi Rs. 43·20.
    (ii) Saxena Rs. 54 ; Sarma Rs. 50 ; Saggi Rs. 52 80.
    (iii) Saxena Rs. 55·56 ; Sarma Rs. 49·48 ; Saggi Rs. 51·05.

34. (i) A – Rs. 12 50, B—Rs. 15·75 (guaranteed minimum), C—Rs. 11·25. (ii) A—Rs. 12, B—Rs. 15·75, C—Rs. 9·75. (iii) A – Rs. 13 20, B—Rs. 15·75, C—Rs. 12·75.

Note :   Price per unit here means piece wage rate per unit.

35. Bonus hours :   X – 12 hours, Y – 20 hours, Z – none.
    Bonus earned :   X – Rs. 16 80, Y   Rs. 20, Z · none.
    Gross wages :   X—Rs. 117·60, Y—Rs. 95, Z   Rs. 12%.
    Wages cost per good unit ·   X – 26 p, Y – 13 p, Z   32 p.

36. Total earnings Rs. 207·00.   Job A – Rs. 81·90 ;   Job B – Rs. 98 50 ;   Overhead Rs. 26·60.

37. Normal rate of wages Rs. 2 per hour.   Cost of materials used Rs. 100.

38. Hourly rate of wages Re. 0 825.

39. Group bonus Rs. 29·80.   Share of bonus : P – Rs. 8·00, Q—Rs. 7·80, R—Rs. 7·20, S · Rs. 6 80.

40. Total earnings per worker Rs. 500, Rs. 495 and Rs. 540 for March, April and May respectively.   Effective rate Rs. 2 50, Rs. 2 58 and Rs. 2·60 respectively.

41. Total earnings :   A—Rs. 35·52 ; B   Rs 25 90.
    Bonus earnings :   A—Rs. 6·72 ; B   Rs. 4·90.

42. Rs. 67·20 ; _ s. 72·00 ; Rs. 57 60 , Rs. 67·20 ; Rs. 57·60 ; Rs. 62·40.

43. Bonus rate per hour Re. 0 96.   Total bonus Rs. 383·52.   Total Wages—A Rs. 278·40, B —Rs. 303·42.   Labour bonus cost per unit Re. 0 0387 or 4 paise.

44. Bonus rate Re. 0·36 per hour.   Amount of bonus Rs. 172·80.   Total earnings— Gorapada Rs. 97·94, Haripada Rs. 127 27.

45. (a) 40·5% , (b) Rs. 162 + Rs. 116·64 + Rs. 189 54 — Rs. 468 18 ;
    (c) Rs. 762 + Rs. 500·64 + Rs. 837·54 = Rs. 2,100·18.

46. Rs. 29·17.

47. Job A—Rs. 14 ; Job B – Rs. 9 ; Job C · Rs. 10·67.   Total Rs. 36·07.
Note :   Overtime premiun. for 4 hours @ Re. 0 60 = Rs. 2·40.

48. Total wages Rs. 42 - to be charged to Job 20 Rs. 14, Job 30 Rs. 25, Costing P/L A/c Rs. 3.

49. Total wages Rs. 58·75—to be charged to Job 30 Rs. 44, Overhead Rs. 4·75, Costing P/L A/c Rs. 10.

50. Employee P :   (a) Rs. 21 ;   (b) Rs. 125 ;   (c) Rs. 3·91
    Employee Q :   (a) Rs. 44 ;   (b) Rs. 140 ;   (c) Rs. 2·50.

51. (a) A—15 hours, Rs. 50 ; B—13 hours, Rs. 52.
    (b) A—Rs. 280 ; B—Rs. 372.
    (c) When O.T. is regular A—Rs. 8·99 ; B—Rs. 9·31
       When O.T. at customer's request A—Rs. 9 15, B—Rs. 9·84.

CHAPTER 5
Overhead

1. (i) Rs. 4,000 ; (ii) Rs. 3,200 ; (iii) Rs. 2,880.

2. (i) (a) Re. 0·431 per direct labour hour ; (b) 59·3% of direct labour cost ; (c) Rs. 1·149 per machine hour.

   (ii) Total cost under (a) Rs. 99·93, (b) Rs. 113·69, (c) Rs. 109·98

3. Direct labour hour rate method Rs. 648·30 ; Machine hour rate method Rs. 628·50 ; Direct materials percentage rate method Rs. 678 ; Direct wages percentage rate method Rs. 679·50.

4. (a) (i) Re. 0·40 per labour hour ; (ii) 63·27% of direct labour cost ; (iii) Rs. 1·24 per machine hour.

   (b) Total cost under (i) Rs. 111·00 ; (ii) Rs. 126·63 ; (iii) Rs. 132 20.

5. Deptt. 1—Machine hour rate Rs. 2 per hour ; Deptt. 2—Percentage of direct labour cost rate 125% ; Deptt. 3 –Labour hour rate Rs. 3 per hour.

6.

		X		Y	
Method	*Recovery rate*	*Overhead*	*Total cost*	*Overhead*	*Total cost*
Direct Labour hr.	Rs. 10	Rs. 4·00	Rs. 6·10	Rs. 4·00	Rs. 7 80
Direct materials %	250%	3·75	5·85	4·50	8·30
Direct wages %	375%	2·25	4·35	7·50	11·30
Prime cost %	150%	3·15	5·25	5·70	9 50

7.

	P	Q
Method	Rs.	Rs.
Percentage of direct material cost	49,069	52,418
Percentage of direct labour cost	54,590	49,450
Percentage of prime cost	52,875	50,400
Rate per direct labour hour	60,750	46,200
Rate per unit of product	51,620	51,070

Note : Machine hour rate method cannot be applied for want of adequate information.

8.

Method	*Recovery rate*		*Overhead*		*Total cost*
	Production	*Finishing*	*Production*	*Finishing*	
Direct labour hour	Re. 0·15	Re. 0·24	Rs. 79·50	Rs. 33·60	Rs. 553·10
Direct wages %	60%	80%	8·00	40·00	558·00
Direct materials %	30%	24%	72·00	4·80	516·80
Machine hour	Re. 0·18	Re. 0·60	91·80	3·00	561·80

9. (a) Rs. 27·50 per hour with computer and Rs. 10 per hour without computer.

   (b) *P* Rs. 17 per hour ; *Q* Rs. 17 per hour , *R* Rs. 27·50 per hour.

10. (a) Deptt. A 115% ; Deptt. B Rs. 5·125 per hour.

    (b) Rs. 1,746·50

    (c) Under (−) over (+) absorbed overhead ; A (−) Rs. 37,500. B (+) Rs. 22,500 . Company as a whole (−) Rs. 15,000.

11. Labour hour rate Deptt. *X* Re. 0·75 ; Deptt. *Y* Re. 1 00. Production cost Rs. 91·70.

12. Under (−) over (+) absorbed overhead : *A* (+) Rs. 1,700 ; *B* (−) Rs. 300 , *C* (+) Rs. 800 ; *D* (−) Rs. 100.

13. (a) (i) Rs. 84,655 (Machine shop Rs. 11,520, Finishing shop Rs. 10,160, Assembly Rs. 14,600, Non-productive Deptts. Rs. 48,375) ; (ii) Rs. 630 under (Machine Shop Rs. 50 under, Finishing Shop Rs. 690 over, Assembly Rs. 510 under, Non-productive Deptts. Rs. 760 under).

    (b) Rs. 500 profit.

14. Overhead rate in terms of S Re. 0·60. Overhead : P Rs. 24,300, Q Rs. 32,400, R Rs. 48,600. S Rs. 56,700, Profit : P Rs. 27,840, Q Rs. 87,120, R Rs. 1,48,680, S Rs. 1,05,960.

15. A—Rs. 32,555, B—Rs. 36,085, C—Rs. 23,860, D - Rs. 27,000.

16 A—Rs. 5·00, B—Rs. 6·125, C—Rs. 4·375.

17. Rs. 71·53, Rs. 32·42, Rs. 42·16.

Note : Misc. expenditure has been allocated on the basis of hours worked.

18. Rs. 17·62.

Note : Misc. expenditure has been allocated on the basis of direct wages and civil maintenance on the basis of space occupied.

19. Rs. 3·82, Rs 4·363, Rs. 15·243, Rs. 4·602, Rs. 3·627.

Note : Shop supervision and general expenses have been allocated on area basis.

20. A—Rs. 42,670, B—Rs. 25,830.

21. X—Rs. 60,821, Y - Rs. 38,179.

22. A—Rs. 27,540, B—Rs 21,740, C—Rs. 15,220.

Note : General expenses have been allocated on the basis of Direct Wages.

23. A—Rs. 2·759, B—Rs. 2·128 C—Rs. 1·704.

24. P_1 - Rs. 1·015, P_2 - Re. 0·772.

25. A Rs 3·86 per direct labour hour ; B Rs. 3·25 per direct labour hour ; C Rs. 6·13 per machine hour ; D Rs. 3·25 per machine hour.

26 Overhead X Rs. 2,10,630 ; Y Rs. 1,01,170. Machine hour rate - X Rs. 105·32 , Y Rs. 33 72.

Note . Power has been distributed on the basis of H.P. × Machine hours., i.e., 20 : 15 . 4 : 1.

27. Overhead—A Rs. 11,396, B Rs. 8,663, C Rs. 7,341 % of overhead to direct wages—A 162·8%, B 144·4%, C 146·8%.

Note : General overheads have been distributed on the basis of direct wages.

28 Total indirect expenses —A Rs. 48,260. B Rs. 1,18,740 ; Indirect expenses rate—A Re. 0·20 per man hour, B Rs. 1·48 per machine hour. Factory Cost—Job A Rs. 252, Job B Rs. 174 80.

29. Absorption rates—Turning Rs 3·48, Milling Rs. 3·01, Grinding Rs. 240.

30. (a) Machine shop Rs. 19,880, Assembly shop Rs 15,000, Spray shop Rs. 7,500. (c) Re. 0·80 per machine hour.

31. (a) Deptt. 1 Rs. 2,28,572, Deptt. 2 Rs. 5,32,143, Deptt 3 Rs. 3 46,429, Deptt. 4 Rs. 4,42,856.

(b) Problems—(1) Choice of appropriate method , (2) Choice of appropriate base, i.e., whether budgeted or actual , (3) In case of reciprocal servicing the method becomes more complicated.

32 A—Rs. 9,92,000, B—Rs. 8,86,000, C—Rs. 6,56,000

33. (a) A Rs. 25,750 ; B Rs. 30,900 ; C Rs. 46,350 ; (b) A Rs. 28,096 ; B Rs. 31,606 ; C Rs. 43,298. (c) A Rs 24,907 ; B Rs. 35,541 ; C Rs. 42,552

34 Expenses incurred—Bleaching Rs. 21,617 , Packaging Rs. 11,083. Expenses absorbed : Blending Rs. 21,667 ; Packaging Rs. 11,000. Over (+) under (−) absorption—Blending (+) Rs. 50 ; Packaging (−) Rs. 83.

35. Overhead incurred—Machining Rs. 16,859 ; Assembly Rs. 9,341. Predetermined absorption rate—Machining Rs. 40 per machine hour ; Assembly Rs. 4 per labour hour. Overhead absorbed during May—Machining Rs. 16,600 ; Assembly Rs. 9,400. Over (+) under (−) absorption : Machining (−) Rs. 259 (representing over-expenditure of overhead Rs. 859 less additional hours 15 × Rs. 40 or Rs. 600) ; Assembly (+) Rs. 59 (representing under-expenditure of overhead Rs. 259 less shortage of hours 50 × Rs. 4 or Rs. 200).

36. (a) Budgeted manufacturing costs: P Rs. 72.75; Q Rs. 46.00. Budgeted overhead: Cutting Rs. 1,89,000; Machining Rs. 96,250; Pressing Rs. 82,000. Absorption rate: Cutting Rs. 2.25 per labour hour; Machining Rs. 3.50 per machine hour; Pressing Rs. 2.00 per labour hour.

(b) Possible reasons: (i) Actual activity level less than the budgeted activity level; (ii) Actual amount incurred less than the budgeted amount; (iii) Seasonal activity—activity of the first month higher than the average activity; (iv) Similarly, actual costs of first month less than the average costs.

37. Rs. 2.00.
38. Rs. 22.
39. Rs. 2.72.
40. Rs. 5.60.
41. Rs. 8.79.
42. Rs. 6.50.
43. Rs. 7.87.
44. Rs. 6.93.
45. Rs. 10.00.
46. Rs. 19.33.
47. Rs. 2.06.
48. Rs. 9.70 (excluding wages of machine operator).

Note : Wages of the machine operator will be included in direct wages of the Jobs concerned. Where, however, an operator looks after a number of machines, his wages will be considered as indirect and hence will be included in machine hour rate.

49. Rs. 11.50.
50. Rs. 11.80.
51. Rs. 16.50.
52. Rs. 3.06.
53. Rs. 1.86.
54. Rs. 7.80.
55. Rs. 4.48.
56. (a) Rs. 5,863.50, (b) Rs. 12.90.
57. Hourly charge: A—Rs. 24.45, B—Rs. 28.24.
    Total profit: A—Rs. 7,824, B—Rs. 9,040.
58. (a) Rs. 4,000, (b) 8,000 hours.
59. (a) (i) Machine area Rs. 4.50; Finishing shop Rs. 4.50.
    (ii) Machine area Rs. 2.57; Finishing shop Rs. 10.50.
    (b) (i) Rs. 50.25; Rs. 34.00; Rs. 58.50
    (ii) Rs. 50.03; Rs. 33.10; Rs. 58.71.
    (d) Fixed cost Rs. 50,000; Variable rate of overhead per hour Rs. 2.
60. Apportioned overheads: Forming Rs. 1,09,190; Assembling Rs. 85,190, Finishing Rs. 85,220. Hourly Overhead absorption rate: Forming Rs. 3.25, Assembling Rs. 1.27; Finishing Rs. 1.69. Fixed overhead cost per unit: A Rs. 5.53; B Rs. 4.26; C Rs. 4.73.

Note : Basis of apportionment: (i) *Area*—Rent and rates, Light and heat, Insurance and maintenance, Building depreciation. (ii) *Value of plant*: Plant repairs, Plant depreciation. (iii) *Size of workforce*—Supervisory staff. (iv) *Total staff*—Personnel, Canteen. (v) *Materials consumed*—Warehouse.

61. (a) Apportioned overheads: A Rs. 1,50,500; B Rs. 1,19,250; C Rs. 1,18,250.
    (b) Absorption rate per hour: A Rs. 4.30; B Rs. 2.65; C Rs. 2.15.
    (c) Selling price Rs. 150.

CHAPTER 6
Job, Contract and Batch Costing

1. Rs. 25 per chair.

2. Total Cost Rs. 2,140, Rs. 5,100 and Rs. 8,800. Selling price per 1,000 copies Rs. 535, Rs. 255 and Rs. 220.

3. Rs. 155·40 per unit.

4. Total cost Rs. 1,940. Selling price Rs. 2,425.

5. Cost of the job Rs. 2,520. profit 19% (approx.).

6. Loss Rs. 61. Mixing department cost Rs. 380, Boiling department cost Rs. 840; Cooling and skimming department cost Rs. 750; Factory cost Rs. 1,970 ; Total cost Rs. 2,561.

7. Cost of the job Rs. 4,991. Selling price Rs. 5,989·20.

8. Job P Rs. 1,016 ; Job Q Rs. 1,104.

9. Rs. 26·20 per unit.

10. Profit to P/L A/c Rs. 8 678. Office overhead @ 10% of works cost Rs. 6,302

11. Accounting profit Rs. 24,300.   Profit to P/L. A/c Rs. 12,960.

12. Accounting profit Rs. 30,750.   Profit to P/L A/c Rs. 15,375.

13. Accounting profit Rs. 7,65,000.   Profit to P/L A/c Rs. 4,08,000.

14. Accounting profit Rs. 10 800.   Profit to P/L A/c Rs. 5,760.

15. Accounting profit Rs. 68 280.   Profit to P/L A/c Rs. 40,968.

16. Accounting profit Rs. 60,000.   Profit to P/L A/c Rs. 32,000.

17. Accounting profit Rs. 84,000.   Profit to P/L A/c Rs. 50,400.

18. Accounting profit Rs. 43,000.   Profit to P/L A/c Rs. 25,800.

19. Accounting profit Rs. 2,86,160.   Profit to P/L A/c Rs. 1,71,696. Value of work-in-progress Rs. 15,11,666.

20. Accounting profit Rs. 2,46,000.   Profit to P/L A/c Rs. 1,47,600.

21. Accounting profit Rs. 28,616.   Profit to P/L A/c Rs. 17,170.

22. Accounting profit Rs. 72,000.   Profit to P/L A/c Rs. 38,400.

23. Accounting profit Rs. 44,800.   Profit to P/L A/c Rs. 23,893.

24. Accounting profit Rs. 81,000.   Profit to P/L A/c Rs. 48,600

25. Accounting profit Rs 73,150.   Profit to P/L A/c Rs. 29,260. Value of work-in-progress Rs. 3,50,740.

26. Contract No. 1—Accounting profit Rs. 20,500. Profit to P/L A/c Rs. 13,120. Contract No. 2—Loss to P/L A/c Rs. 17,100.

Note : If a loss is disclosed by a contract not yet completed, the whole amount thereof should be charged to the P/L A/c of the year. Besides if it is considered that a further loss will be incurred before it is completed, a provision should be made for that.

27. (a) Accounting profit Rs. 45,000 and Rs. 20,000. Profit to P/L A/c Rs. 24,000 and Rs. 12,000.

    (b) Value of contract Rs. 1,38,000 and Rs. 1,12,000 to be shown on the assets side of the B/S as reduced by the amount of cash received.

28. (a) Accounting profit Rs. 8,80,000, Profit to P/L A/c Rs. 5,28,000

    (b) Value of work-in-progress Rs. 53,48,000.

29. Accounting profit Rs. 1,73,550. Profit to P/L A/c Rs. 1,04,130.

30. Accounting profit Rs. 22,260. Profit to P/L A/c Rs. 13,356.

31. Accounting profit Rs. 1,58,000   Profit to P/L A/c Rs. 86,900.

32. Accounting profit Rs. 45,000. Profit to P/L A/c Rs. 24 000.

33. Accounting profit Rs. 39,000. Profit to P/L A/c Rs. 23,400.

Note : Assumed that salvaged materials have not been used in the contract.

34. Accounting profit Rs. 1,50,000. Profit to P|L A|c Rs. 88,500. Value of work-in-progress Rs. 5,51,000. This will appear on the assets side of the B|S as reduced by the amount of cash received Rs. 5,31,000.

35. Accounting profit Rs. 96,400. Profit to P|L A|c Rs. 57,840. Cost of uncertified work Rs. 83,400 (i.e., $\frac{2}{10} \times$ total cost).

36. Cost of certified work Rs. 1,07,250 (i.e., Rs. 1,43,000 × $\frac{5}{8}$ × $\frac{1}{1}$). Cost of uncertified work Rs. 35,750 (i.e., 1,43,000 – 1,07,250). Accounting profit Rs. 42,750. Profit to P|L A|c Rs. 22,600.

37. Loss to P|L A|c Rs. 3,010 (including Rs. 1,000 prov. made for fine likely to be imposed).

38. Profit to P|L A|c for '85 Rs. 3,920. Value of plant on 31-12-85 Rs. 8,742 and WIP 36,233. Loss to P|L A|c for '86, Rs. 1,046.

39. Value of work-in-progress : X Rs. 38,575 ; Y Rs. 19,580 ; Z Rs. 13,640. Profit (loss) included : X Rs. 8,105 ; Y (Rs. 7,700) ; Z nil.

Note : Contract Z is in its early stages. It is difficult to foresee if an overall profit will be made. Since no loss is anticipated from the contract, it has been valued at cost.

40. Estimated total profit Rs. 79,000. Profit to P|L A|c Rs. 29,625.

41. Estimated total profit Rs. 5,300. Profit to P|L A|c Rs. 3,445.

42. 25 days and 20 units.

Note : A year has been taken of 365 days.

43. Cost per unit of each batch Rs. 10 ; Profit per unit of each batch Rs. 5. Profit for 3,000 units Rs. 15,000. Overhead for the batch : Jan. Rs. 3,750 ; Feb Rs. 3,000 , March Rs. 3,000.

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CHAPTER 7

Process Costing
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1. Cost per ton : Process I Rs. 15·90 ; Process II Rs. 23·10 , Process III Rs. 34·00.

2. Cost per unit : Process A—Rs. 8·31 : Process B—Rs. 21·00.

3. Cost per unit : Process A – Rs. 2·09 ; Process B —Rs. 3·60 ; Process C—Rs. 4·41.

Notes : (1) Wastages in Process A. nil. in Process B 1,500 units, in Process C 500 units. Assumed wastages are normal and have no realisable value.

(2) Opening stocks will be valued at current costs assuming there is no fluctuation in process costs.

4. Cost per ton : Process 1 Rs. 160 ; Process 2 Rs. 215 ; Process 3 Rs. 132·50.

5. Cost per ton : Process I Rs. 316·67 ; Process II Rs. 447·06 ; Process III Rs. 798·43. Total loss Rs. 3,760.

6. (a) Rs. 3,600 ; (b) Rs. 1,480.

7. Selling price per unit Rs. 422 11. Cost of 1,500 units transferred to polishing process Rs. 3,75,000 ; Value of work-in-progress Rs. 87,000 (Pressing Process). Cost of 700 units completed Rs. 2,21,607 ; Value of work-in-process Rs. 2,29,993 (Polishing Process).

8. Transfer to Process C Rs. 6,240 (800 units @ Rs. 7·80 ; Value of work-in-process Rs. 1,148 (200 units @ Rs. 5·74).

9. Value of output transferred : Process 1 Rs. 24,643 (Materials Rs. 7,500, Direct Wages Rs. 6,857, Factory Overhead Rs. 10,286) ; Process 2 Rs. 35,028 (Materials Rs. 23,154 from Process 1 and Rs. 4,000 from Process 2. Direct Wages Rs. 3,445. Factory overhead Rs. 4,429). Value of Work-in-progress : Process 1 Rs. 5,357 (Material Rs. 2,500. Direct Wages Rs. 1,143. Factory overhead Rs. 1,714) ; Process 2 Rs. 1,615 (Material Rs. 1,489 from Process 1, Direct Wages Rs. 55; Factory overhead Rs. 71).

10. (a) Completed and transferred to finished goods 19,000 litres. (b) Costs charged to the process Rs 96,800. (c) Cost of finished goods Rs. 60,800. (d) Value of closing work-in-progress Rs. 36,000.

11. Value of output transferred Rs. 74,900 (1,000 units @ Rs. 8·90 and 6,000 units @ Rs. 11·00) ; Value of work-in-progress Rs. 10,800 (2,000 units @ Rs. 5·40).

12. Value of finished goods Rs. 12,00,000 ; Value of work-in-progress 44,400.

Note : The problem must be solved using the weighted average basis. The FIFO basis cannot be applied here, since no details of work already performed or opening work-in-progress are given.

13. Rs. 22,720.

Note : The problem must be solved applying the FIFO basis since no details of the cost of opening work-in-progress are given.

14. Value of output transferred Rs. 28,220 ; Value of work-in-progress Rs. 3,100 ; Value of abnormal loss Rs. 1,650 out of which Rs. 600 recovered from scrap sale and balance Rs. 1,050 transferred to P/L A/c.

15. Value of output transferred Rs. 8,29,500 (56,000 units @ Rs. 14·8125) ; Value of work-in-progress Rs. 2,60,500 applying the average method of valuation.

16. Transfer to next process/finished goods from : Process 1 Rs. 4,35/· (at Rs. 15 per unit) Process 2 Rs. 5,400 (at Rs. 22·50 per unit). Process 3 Rs. 8,505 (at Rs. 26·25 per unit). Value of work-in-progress : Process 2 Rs. 1,020, Process 3 Rs. 745. Transfer to cost of sales Rs. 8,505 (at Rs. 26·25 per unit) ; Value of closing finished goods Rs. 1,995 (at Rs. 26·25 per unit).

17. Value of finished goods Rs. 78,750 ; Value of work-in-progress Rs. 62,250.

Note : Cost per equivalent unit Rs. 3,500 Market value Rs. (4,500 − 30% thereof) or Rs. 3,150. Market value will be the basis of valuation (this being lower than the cost).

Value of finished goods : 25 × Rs. 3,150 = Rs. 78,750

Value of work-in-progress :

Direct materials 25 × Rs. 1,500	=	Rs. 37,500
Labour and overhead 25 × Rs. (3,150 − 1,500)	=	Rs. 24,750
		Rs. 62,250

18. Transfer to finished goods Rs. 41,000 (4,100 units @ Rs. 10). Abnormal loss transferred to P/L A/c Rs. 1,600.

19. Transfer to next process/finished goods from : Process A Rs. 68,056, Process B Rs. 1,09,725, Process C Rs. 1,40,070. Abnormal wastage— Process A 400 units Rs. 1,944, Process B 100 units Rs. 831, Process C 180 units Rs. 2,155.

Notes : (i) Abnormal wastage (units)—Actual wastage *less* normal wastage.
(ii) Assumed normal wastage has no realisable value.

20. Transfer to next process/finished goods from : Process 1 Rs. 22,500, Process 2 Rs. 36,000. Abnormal gain—Process 1 Rs. 1,250 ; Transfer to P/L A/c Rs. 1,000. Abnormal loss—Process 2 Rs. 450 ; Transfer to P/L A/c Rs. 375.

21. Transfer to next process/finished goods from : Process A Rs 30,600, Process B Rs. 54,330. Process C Rs. 93,180. Abnormal wastage—Process B (30 units) Rs. 970. Abnormal gain—Process C (72 units) Rs. 4,470.

22. *Transfer to next process/finished goods from : Process A Rs. 43,750, Process B Rs. 66,735.* Abnormal wastage—Process A (500 units) *Rs. 1,250 ; Transfer to* Costing P/L A/c Rs. 750. Abnormal gain—Process B (200 units) Rs. 785 ; Transfer to Costing P/L A/c Rs. 385.

23. Transfer to next process/finished goods from : Process A Rs. 14,800, Process B Rs. 25,200. Abnormal wastage—Process A (400 kg.) Rs. 200 ; Transfer to Costing P/L A/c Rs. 80. Abnormal gain—Process B (360 kg.) Rs. 252 ; Transfer to Costing P/L A/c Rs. 144.

24. Transfer to next process/finished goods from : Process X Rs. 24,853, Process Y Rs. 36,336, Process Z Rs. 40,151. Abnormal wastage—Process X (100 units) Rs. 127, Process Z (920 units) Rs. 2,309 ; Transfer to Costing P/L A/c Rs. 2,247. Abnormal gain—Process Y (275 units) Rs. 532 ; Transfer to Costing P/L A/c Rs. 518·22.

25. Transfer to next process/finished goods from : Process A Rs. 56,700, Process B Rs. 93,240, Process C Rs. 1,24,400   Abnormal wastage—Process A (2,000 kg.) Rs. 2,800, Process C (25 kg.) Rs. 50 ; Transfer to Costing P/L A/c Rs. 2,438. Abnormal gain—Process B (1,050 kg.) Rs. 1,764 ; Transfer to Costing P/L A/c Rs. 1,344.

26. Transfer to next process/finished goods from : Process 1 Rs. 36,800. Process II Rs. 53,422, Process III Rs. 73,249. Abnormal gain—Process I (40 units) Rs. 800. Process II (32 units) Rs. 982, Process III (34 units) Rs. 1,557, Transfer to Costing P/L A/c Rs. 2,919.

27. Transfer to next process/finished goods from : Process I Rs. 9,000. Process II Rs. 17,000, Process III Rs. 21,600. Abnormal wastage—Process II (20 units) Rs. 1,000 ; Transfer to Costing P/L A/c Rs. 920. Abnormal gain - Process III (15 units) Rs. 1,200 ; Transfer to Costing P/L A/c Rs. 1,125.

28. Transfer to next process/finished goods from : Process I Rs. 19,000, Process II Rs. 33,600, Process III Rs. 57,000. Abnormal wastage· Process II (15 units) Rs. 600 ; Transfer to Costing P/L A/c Rs. 480. Abnormal gain—Process III (36 units) Rs. 2,736 ; transfer to Costing P/L A/c Rs. 2,376.

29. Transfer to next process/finished goods from · Process A Rs. 1,27,564, Process B Rs. 2,44,907, Process C Rs. 3,21,474. Abnormal wastage ·Process A (200 units) Rs. 2,686. Process C (272 units) Rs. 10,795 ; Transfer to Costing P/L A/c Rs. 12,919. Abnormal gain—Process B (75 units) Rs. 2,918 ; Transfer to Costing P/L A/c Rs. 1,943.

30. Cost per unit Rs. 9·50 (Raw material Rs. 5·00, Other materials Re. 1·00, Direct wages Rs. 2·00, Overheads Rs. 1·50).

Notes : (i) Degree of completion of abnormal loss has not been given in the problem. It has been assumed that abnormal loss arises after 100% completion.

   (ii) Value of finished goods, abnormal loss and work-in-progress (if asked for) will be Rs. 28,500, Rs. 1,900 and Rs. 4,500 respectively.

31. Transfer to finished stock Rs. 7,560 (2,100 units @ Rs. 3·60) ; Value of Work-in-progress Rs. 561, Value of abnormal loss Rs. 450 (125 units @ Rs. 3·60).
   Cost per unit Rs. 3·60 (Material Rs. 3·00, Wages Re. 0·40, Direct costs Re. 0 20).

32. (a) Equivalent units of production :   Materials 16,000 ;   Labour and Over-heads Rs. 14,000.

   (b) Cost per equivalent unit Rs. 6 (Material Rs. 3, Labour Re. 1, Overheads Rs. 2).

   (c) Cost of finished output Rs. 99,000 (13,500 units @ Rs. 6) and of work-in-progress Rs. 18,000.

   (d) Abnormal gain transferred to P/L A/c Rs. 8,000.

33. Wastage in Process C 5%.

Note : Transfer from Process A to Process B (9,500 units) Rs. 25,325. Transfer from Process B to Process C (9,120 units) Rs. 49,263. Total cost of Process C before crediting scrap realisation Rs. 69,768. Assuming wastage in Process C is x units the net cost of (9,120−x) units=69,768−x

   [∵ x units @ Re. 1=x].   Cost per unit=$\dfrac{69,768-x}{9,120-x}$.

34. Transfer to next process/finished goods from :   Process A Rs. 70,000 ; Process B Rs. 1,10,400, Provision for unrealised profit on stock—Process A nil ; Process B Rs. 1,120 ; Finished goods Rs. 2,834. Actual realised profit Rs. 48,046.

35. (a) Profit—Process I Rs. 30,000 ; Process II Rs. 60,000 ; Process III Rs. 35,000 : Finished stock Rs. 60,000. (b) Rs. 1,71,084. (c) Rs. 44,465.

36. A Rs. 9,800 ; B Rs. 31,200.

37. A Rs. 32 ; B Rs. 40 ; C Rs. 48.

38. A Rs. 3,600 ; B Rs. 5,600.

39. Share of joint expenses : P Rs. 28,000 ; Q Rs. 12,000 ; R Rs. 14,000.

40. Limpa Rs. 133·50 per kg. and Pimpa Rs. 168 per kg. Share of Pimpa in joint costs Rs. 31,800.

41. Share of joint costs—P Rs. 6,733, Q Rs. 3,267.
    Cost of production—P Rs. 11,733, Q Rs. 6,267.

Note : Calculation of selling and distribution expenses :

		Rs.
Total selling price of P and Q		24,000
Less : Profit P 25% on Rs. 16,000	4,000	
Q 20% on Rs. 8,000	1,600	5,600
Cost of sales		18,400
Less : Total production cost (10,000 + 5,000 + 3,000)		18,000
Balance being selling and distribution expenses		400

42. Profit without further treatment of by-product Rs. 10,000. Additional profit after further treatment : Q Rs. 800, Rs. 1,100.

43. (a) Profit (loss) Rs. 10,000 [A (Rs. 10,000), B Rs. 12,000, C Rs. 8,000].
    (b) Maximum profit Rs. 16,000 if A and C are processed further and B is sold at separation.

44. A Rs. 500, B Rs. 750, C Rs. 3,000, D Rs. 5,000, E Rs. 14,000, F Rs. 6,000, G Rs. 23,000, H Rs. 1,200, I Rs. 3,000, J Rs. 4,600, K Rs. 5,000, I Rs. 1,800 gain, M Rs. 400 loss, N Rs. 600 gain, O nil, P Rs. 2,000 gain.

CHAPTER 8
Operating Costing

1. Cost per Km Re 1.
2. Cost per Kwh Rs. 7·50.
3. Cost per passenger-km. Re. 0 115
4. Cost per passenger-km. Re. 0·03
5. Cost per passenger-km. Re. 0·04
6. Cost per Km. Rs. 1·635
7. Cost per Km. Rs. 1·65. Profit Rs. 57,600
8. Fare to be charged Re. 0·365
9. Cost per tonne-mile—Lorry A Re 0·1178
                         —Lorry B Re. 0·6305
   Cost per passenger-mile -Bus C Re. 0·0191

(*Note* : The unit of cost for lorry carrying raw materials is tonne-mile and that for bus carrying passengers is passenger-mile, calculated as under :

Lorry A : $\frac{100}{30}$ tonnes × $\frac{3,000}{30}$ miles × 30 days = 10,000 tonne-miles

Lorry B : $\frac{120}{30}$ tonnes × $\frac{4,500}{30}$ miles × 30 days = 18,000 tonne-miles

Bus C :   25 passengers × $\frac{2,000}{25}$ miles × 25 days = 50,000 passenger-miles.)

10. Cost per tonne Km. .
    Indian Oil 53·17 paise, Bharat Petroleum 58·38 paise

CHAPTER 9
Accounting Records

1. Profit Rs. 8,604 (writing off under-recovery of overheads). Closing balances : Stores Rs. 8,280, Cost Ledger Rs. 28,590. Goods finished during the year Rs. 1,35,060. Cost of sales Rs. 1,39,530.

2. Profit Rs. 16,000.

3. Profit Rs. 21,316. Closing balances : Stores Rs. 19,982 : Work-in-Progress Rs. 12,502 ; Finished Goods Rs. 4,910 ; General Ledger Rs. 37,394.

4. Closing balances : Raw materials Rs. 26,860, Work-in-Progress Rs. 11,440.

Note : Over-absorption of production overhead (Rs. 5,380) may be carried forward in the Production Overhead A/c or may be transferred to Costing P/L A/c.

5. Closing balances : Raw materials Rs. 1,17,688 ; Work-in-Progress Rs. 66,630 : Factory overhead Rs. 10,180 ; Finished Stock Rs. 1,12,908 ; Cost Ledger Rs. 3,07,406.

6. Closing balances : Stores Rs. 1,890 ; Administration Overhead Rs. 6 ; Work-in-Progress Rs. 2,052 : Finished Goods Rs. 1,386 ; Cost Ledger Rs. 5,334.

9. Profit as per cost accounts Rs. 7,500 and as per financial accounts Rs. 7,800.

10. Profit as per cost records : Product A Rs. 7,500. Product B Rs. 6,200. Total Rs. 13,700. Profit as per financial records Rs. 13,600.

11. Profit as per cost records : Model A Rs. 21,120, Model B Rs 42,336, Total Rs. 63,456. Profit as per financial records Rs. 63,600.

14. Profit as per cost accounts Rs. 97,000.

16. Profit as per cost accounts Rs. 1,82,400.

Note : Outstanding wages are included in costs. No adjustment is, therefore, required for the outstanding amount of Rs. 20,000.

18. Profit as per financial accounts Rs. 1,29,500.

Note : Audit fees should not appear in the reconciliation statement as this expense is treated alike in the financial and cost accounts.

23. Profit as per cost accounts Rs. 5,346. Under-recovery of factory overhead Rs. [15.000−(1,640×8+1,200)] or Rs. 680, Over-recovery of administration overhead Rs. (14,000−1,640×10) or Rs. 2,400. Closing stock of finished goods as per cost accounts Rs. 1,766.

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